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MARKSCHEME

May 2004

ECOSYSTEMS AND SOCIETIES

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 (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.
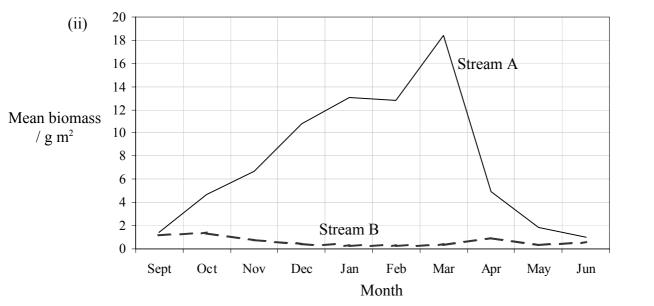
Section B

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)   population numbers decrease from October until June;
                  mean mass increases (exponentially) from September until March and then slows
                  down / *OWTTE*;   *[2]*
                  Accept other valid answers.
                  Answer should make reference to the data in figures 1 and 2.

        (ii)   stream A demonstrates a slow decline in population size whereas stream B shows a
               dramatic exponential decline / *OWTTE*;
               the maxima for population size and mean mass are higher for stream A;   *[2]*
               Accept other valid answers.
               Answer should make reference to the data in figures 1 and 2.

        (iii) $\dfrac{6350 - 44}{6350} \times 100 = 99.3\%$;   *[1]*

    (b)   (i)   the mass of organic material in organisms or ecosystems (usually per unit area);   *[1]*

          (ii)

          Award [1] for each line.   *[2]*

    (c)   (i)   a major pollution incident is the most likely;
               whereby water quality has been severely affected in stream B causing the mayfly
               population to crash;   *[2]*
               Accept other reasonable answers e.g. eutrophication, disease (endemic).

          (ii)   populations of predator species may crash if mayfly are the only food;
                 mayfly prey numbers may increase as mayfly numbers fall;
                 populations of other prey species may also suffer if mayfly disappear and
                 predators switch prey;   *[2 max]*

(d)   (i)   *e.g.* using electro-fishing techniques / netting a significant number of trout could be caught, tagged and released;
important to ensure that the capture and tagging does not stress/harm the fish;
later (next day) the capture exercise would be repeated using the same effort and time as before;
the fish caught would be noted as tagged or untagged and the Lincoln index applied;   *[3 max]*
Award [1] for concept of capture—mark—release—recapture without giving an outline of the method.

  (ii)   *Award [1] for each factor with an explanation, e.g.*

oxygen content – the amount of oxygen in the water will influence the ability of organisms to respire / high levels of oxygen – high respiration potential;

pH – the pH of the water will affect the stream chemistry which in turn will affect the plants and animals / extremes of acid and alkaline conditions will stress both plants and animals / pH will influence the species types present;

temperature – water temperature affects both plant and animal biochemistry / warmer water suits some species and not others / extreme temperatures may alter water chemistry and oxygen content;   *[3 max]*
Accept other reasonable answers.

  (iii)   *r*-strategists produce a large number of offspring from which few reach reproductive age;
exhibit little or no parental care;
well adapted to colonize new habitats rapidly / make opportunistic use of short-lived resources;
less subject to feedback control;   *[2 max]*

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.

2.   (a)   *Answer should be balanced to include both examples of animals that are prone to extinction and those that are not.*

   Factors which may leave an animal prone to extinction include:
   small population size *e.g.* blue whale – influences reproductive success / prone to disease / inbreeding / susceptible to environmental change;
   reduced genetic pool – prone to mutations due to inbreeding / genetic weakness leading to physical weakness;
   over hunting *e.g.* rhino;
   loss of habitat *e.g.* panda / fragmented habitat – lack of food resources / lack of space;

   Factors that may lead to an animal being less prone to extinction:
   large population *e.g.* cockroach – less affected by predation / large genetic pool;
   extensive geographical range – less susceptible to individual habitat loss;
   non-specialist existence *e.g.* the rat – survives in many environments;   *[5 max]*

   (b)   rare;
   vulnerable;
   endangered;
   extinct;
   unknown;
   Three correct [2], two correct [1], one or zero correct [0].

   reduction in total population of a species;
   levels of exploitation;
   habitat decline / loss;
   habitat fragmentation / population isolation;
   number of populations low / in decline;
   low number of mature adults; *[3 max]*

   relevant use of examples; *[1 max]*

                                                                                    [6 max]

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(c) *Answers should show what the candidate believes to be the best strategy for conserving a named protected area and evaluate the strategy against other strategies. Good answers will also include case histories or examples that have worked. Award **[1]** for naming a protected area, e.g. Masai Mara*;
e.g. creating community support for the area;
supplying adequate funding and resources;
carrying out relevant research and monitoring;
protecting with legislation;
policing and guarding;
giving the site economic value;   ***[6 max]***
Accept other reasonable answers.

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

Total [20 marks]

3. (a) *Answer should demonstrate an understanding of atmospheric insulation and how this is achieved within the atmosphere. Particular reference should be made to the role of carbon dioxide, which is transparent to incoming radiation and absorbs out going radiation.*
greenhouse gases transparent to incoming short wave solar radiation;
out going long wave radiation trapped/reflected by greenhouse gases;
gases include CO_2, CH_4, N_2O, O_3, H_2O and CFCs ;
Two correct gases needed for [1].

creates a "thermal blanket";
maintains an average Earth temperature of about 30 °C ;   *[4 max]*

(b) *Answer should address biomes, global agriculture and human society.*

biomes:
north/south shift in biomes relative to the equator (latitude shift);
movement of biomes up slope (altitude shift);

agriculture:
crop zones move north/south from equator;
e.g. wheat belt in North America may move north;
cultivation patterns will change;
crop types may change;
water resources will change and limit/expand crop production;
changing global weather patterns will influence rain patterns and alter crop production dynamics;

society:
national resources base will change;
water resources will change;
which will drive economic, social and cultural change;
sea level rise may cause economic and social stress due to loss of land and resources
(including migration);   *[7 max]*
Accept any other reasonable answers.
All of the above should be supported by case study evidence or examples.

(c) *Award [3 max] for any three of the following.*
systems models are not always accurate;
model is less complex than reality;
data series too short for confident predictions;
not all elements are known or understood;

Award [1] for each of the following.
present trend based on data collected since industrial revolution;
long-term data (10 000 years) show climate fluctuation cycles not overall rise;
some models predict future rise others argue for future cooling;   *[6 max]*
Accept any other reasonable answers.

Expression of ideas max [3 marks]

Total [20 marks]

4. (a) the aggregate material (both organic and mineral) that covers the Earth's surface in which most terrestrial plants grow;
initial mechanical and chemical breakdown of parent material;
biotic establishment within the mineral soil;
development by decomposition of an organic medium within the soil;   *[4]*

(b) *Award [3 max] for any three of the following.*
the removal of soil material at a rate greater than it can be replenished;
soil degradation may also include loss of soil volume through erosion;
loss of vegetation leading to erosion;
over irrigation leading to salinization;
positive feedback – loss of cover leads to leaching of nutrients, leading to loss of cover;

Award [2 max] for direct consequences:
loss of soil depth leads to loss of productivity / loss of plant stability / loss of slope stability / loss of available nutrients / reduction in water retention potential;
loss of fertility due to loss of nutrients caused by poor management;

Award [2 max] for indirect consequences:
contamination of adjacent environments (particularly aquatic environments);
landscape instability through soil erosion;   *[7 max]*

(c) (i) technology and scientific techniques used to overcome soil degradation problems thus conserving soil;
modern plowing technology and practise, *e.g.* contour plowing;
the use of new crop strains, *e.g.* genetically modified grain;
the development of new devices, *e.g.* windbreaks and strategic shelter belts;   *[3 max]*
Accept other reasonable answers.

(ii) ecocentric approach conservative;
reluctant to adopt new technology;
adopt solutions that are holistic and environmentally friendly;
e.g. application of organic fertilizers / crop rotations / shelter belts / farming on a smaller scale / non-industrial farming;
reluctance to use heavy machinery due to soil compaction and energy issues;   *[3 max]*
Accept other reasonable answers.
No credit should be given for naming the farming system. However, if farming system is not named award [5 max].

Expression of ideas max [3 marks]

Total [20 marks]

5.   (a)   *The system should be both terrestrial or both aquatic. Examples could compare salmon fishing in Norway with rice fish farming in Thailand, intensive beef farming in North America and Masai herding in Kenya. No credit should be given for naming the food production system. However, if food production system is not named award* **[5 max]**.

Award **[2 max]** *for resource inputs.*
The following points could be considered:
comparison of contrasting fertilizer use;
variation in water resource use;
labour input;
energy input;

Award **[2 max]** *for resource outputs.*
The following points could be considered:
consideration of variation in system productivity;
reference to net and gross production;

Award **[2 max]** *for technology.*
The following points could be considered:
comparison of the variation in technology and the implication for the system;
technology may include machinery and organic technology *e.g.* GM crops, the use of draft
animals versus agricultural machinery;   **[6 max]**
Any other reasonable answers.

(b)   *Answers should clearly demonstrate the direct and indirect impact of the two farming systems on their immediate environment. The nature of the systems chosen will dictate the content of the answer.*

salmon fishing in Norway:
organic debris contamination of coastal waters from waste food and excreta;
the addition of steroids and other chemical waste to the adjacent coastal waters;
accidental escape and the contamination of local gene pools;
potentially introduces non-natural genetic variation;

rice fish farming:
impacts on local biodiversity – both plants and animals;
introduces alien species;
changes nutrients budget;
impacts directly on natural resources / food within the system;   **[5 max]**

Answers must refer to both systems for full marks.

(c)   (i)   *Award [2 max] for any of the following.*
food resources needs:
needs will change over the next 100 years as the global human population continues to increase;
as countries develop further their demand for a greater variety of food products (at a greater level) will expand;
dietary animal protein will increase / food fashion may change;
change in productivity due to environmental degradation will further stress systems;

Award [2 max] for any of the following.
achievement of food resource change:
adoption of new crop varieties;
use of GM crops;
increased productivity driven by new technology and farming initiatives;   *[4 max]*

   (ii)   environmental stress;
more land required for food production;
agricultural intensification;
loss of diversity;   *[2 max]*
Accept other reasonable answers.

Expression of ideas max [3 marks]

Total [20 marks]