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ENVIRONMENTAL SYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 1

Thursday 10 May 2012 (afternoon)

1 hour

Candidate session number

0	0							

Examination code

| 2	2	1	2	–	6	3	0	1

INSTRUCTIONS TO CANDIDATES

*   Write your session number in the boxes above.
*   Do not open this examination paper until instructed to do so.
*   Answer all questions.
*   Write your answers in the boxes provided.
*   A calculator is required for this paper.
*   The maximum mark for this examination paper is *[45 marks]*.

1.   Figure 1 below shows data for the wild tiger population and the remaining forest cover in their habitat. The graph also shows the predicted tiger numbers under two scenarios:

- if tiger habitat is restored and protected
- if no action is taken.

Figure 1
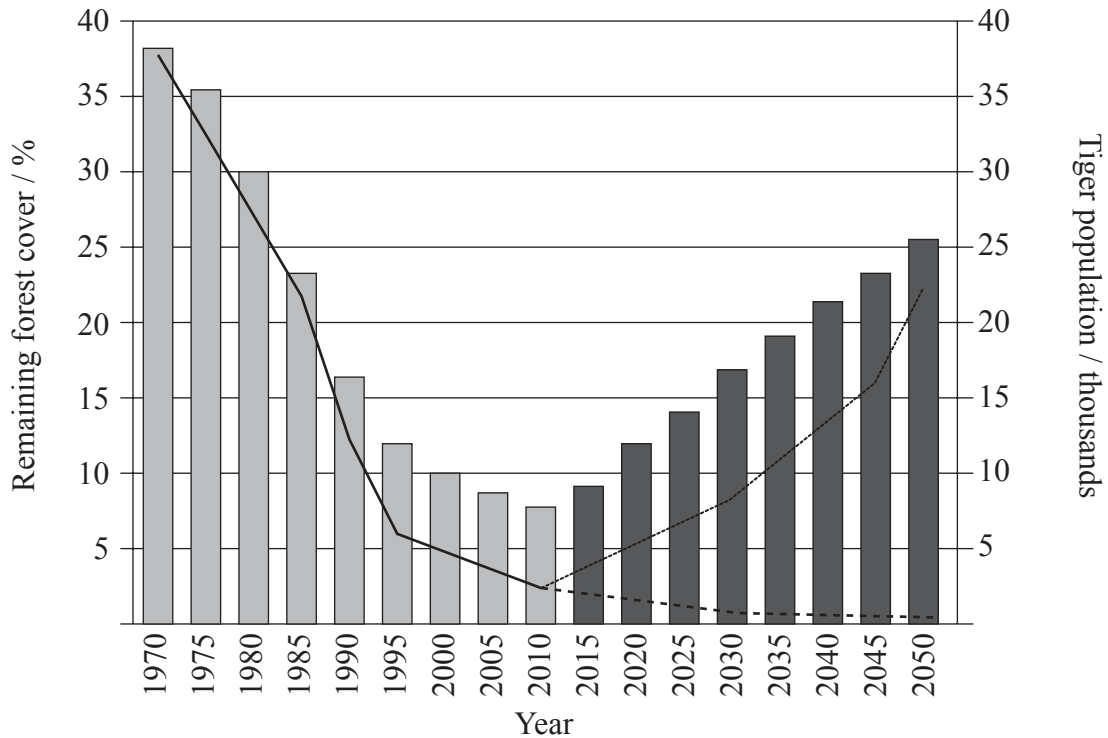
Key:

▢ Remaining forest cover in tiger habitat

■ Target for forest restoration and protection

— Historical tiger numbers (before 2010)

········· Predicted tiger numbers if tiger habitat is restored and protected (beyond 2010)

- - - - Predicted tiger numbers if no action is taken (beyond 2010)

[Source: http://wwf.panda.org/what_we_do/endangered_species/tigers/about_tigers/tiger_population/© World Wildlife Fund.
Used with permission.]

(a)   Outline the relationship between tiger population and the remaining forest cover between 1970 and 2010.   *[1]*

....

....

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(Question 1 continued)

(b)   Suggest **one** method that could have been used to estimate the tiger population.   *[1]*

(c)   Outline **one** difficulty that might be encountered in collecting this type of data.   *[1]*

(d)   Suggest **two** criteria that should be used to design a protected area for tigers.   *[2]*

(e)   The World Wide Fund for Nature (WWF) estimates that there are now more tigers in captivity than in the wild. Evaluate the use of zoos for the preservation of the tiger population.   *[3]*

2. (a) A small lake is going through the process of eutrophication. State **one** possible point
source and **one** possible non-point source of nutrient pollution in the lake.   *[2]*

Point source:

. . . .

. . . .

Non-point source:

. . . .

. . . .

(b) Explain whether a small lake should be considered an open, closed or isolated system.   *[2]*

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(c) Define the term *biochemical oxygen demand* (BOD).   *[1]*

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. . . .
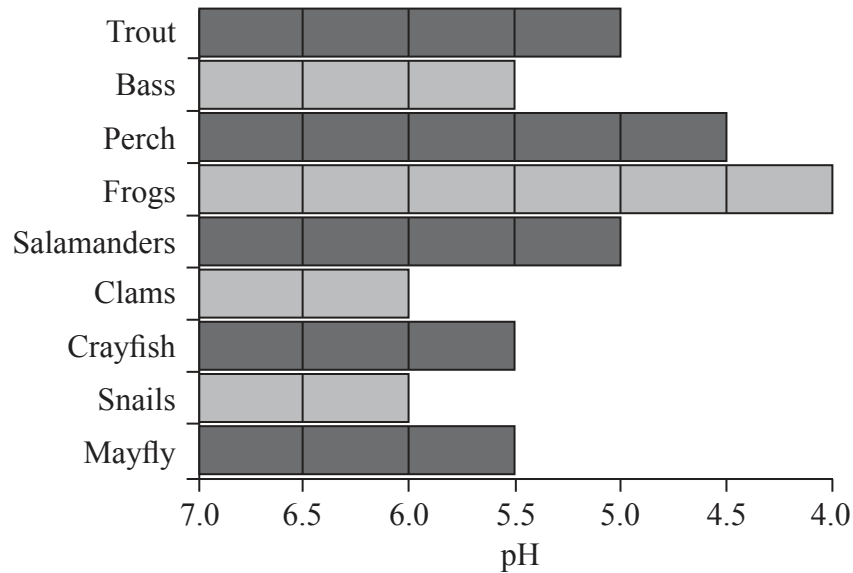
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(Question 2 continued)

(d)   Figure 2 below shows the ranges of pH over which different types of aquatic organisms in a small lake can survive.

Figure 2

[Source: adapted from http://www.epa.gov/airmarkets/acidrain/effects/surfacewater.html.
Used with permission.]

(i)   State which organism(s) would still be present if the pH of the lake was reduced to 5.0.   *[1]*

(ii)   Explain why the populations of remaining organisms in the lake may decline in the long term.   *[2]*

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Answers written on this page
will not be marked.

3.   (a)   Deduce, giving a reason, whether the figure below could represent the transfer of energy
in a terrestrial ecosystem.   *[1]*

Secondary consumer

Primary consumer

Producer
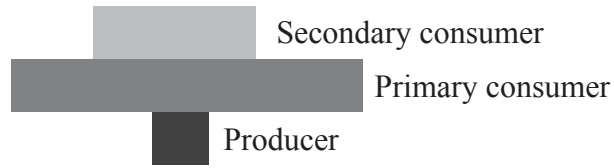
(b)   Define the term *species*.   *[1]*

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Turn over

(Question 3 continued)

(c)   Figure 3 below shows the species composition of two areas of forest. There are 100 trees in each area of forest.

Figure 3

	Abundance of organisms	
	Ecosystem A	**Ecosystem B**
White pine	84	50
Red maple	16	50

Simpson's diversity index can be calculated by applying the formula below:

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

where: N = total number of organisms of all species
          n = number of organisms of a particular species.

The Simpson's diversity index for Ecosystem A is 1.38. Calculate Simpson's diversity index for Ecosystem B.   *[2]*

....

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(Question 3 continued)

(d)   The organisms shown below (not drawn to scale) were found in an aquatic ecosystem.
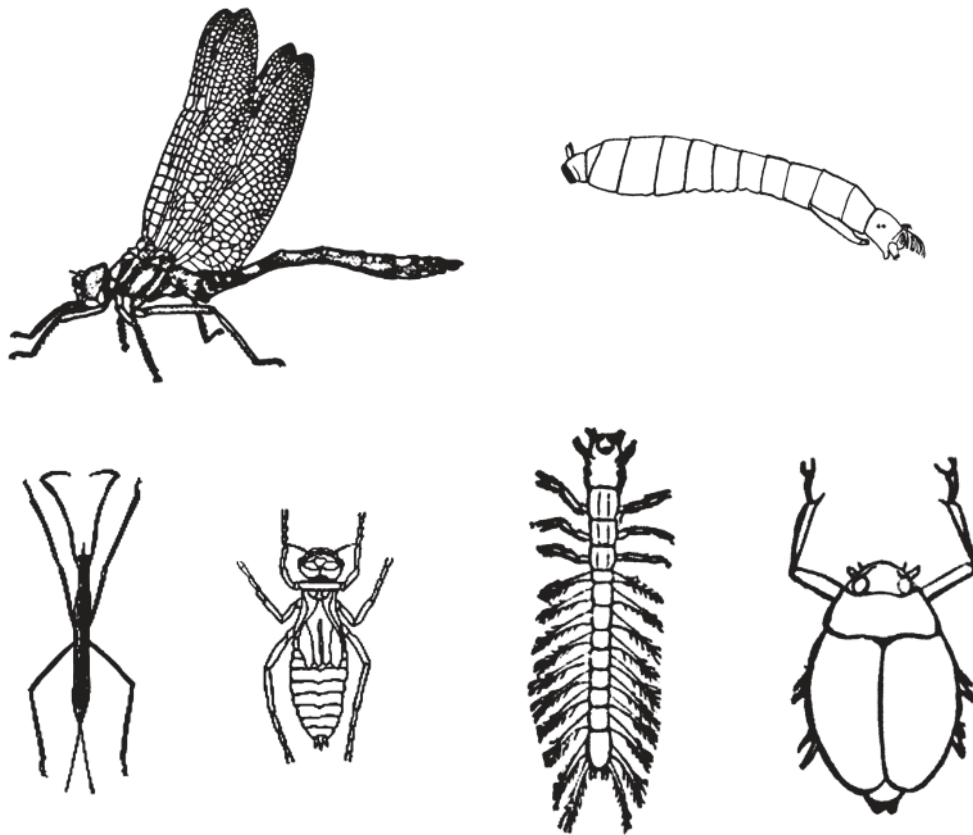
(i)   Suggest **two** visible characteristics of the organisms shown above which could be
        used to construct an identification key.   *[1]*

        ....
        ....

(ii)   Identify **one** limitation of using a key to identify an organism.   *[1]*

        ....
        ....

4. (a) Figure 4 below shows information for Mozambique, a Less Economically Developed Country (LEDC) and France, a More Economically Developed Country (MEDC).

Figure 4

Country	Population / millions	Land area / km²	Forest area / % of land area	Ecological footprint *per capita* / ha
Mozambique	19.7	801 590	39	0.76
France	60.9	547 030	28	7.27

[Source: Nationmaster (2004), www.nationmaster.com]

(i) Calculate the **total** ecological footprint for the population of Mozambique. *[1]*

(ii) Explain the difference between the ecological footprints of the two countries. *[3]*

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(Question 4 continued)

(b) (i) Define the term *carrying capacity*. *[1]*

> ....
> ....

(ii) Explain why it is difficult to give a precise value for a country's carrying capacity for a human population. *[3]*

> ....
> ....
> ....
> ....
> ....
> ....

5.   The graph in Figure 5 below shows how soil textures are classified by the proportions of sand, silt and clay present.

Figure 5

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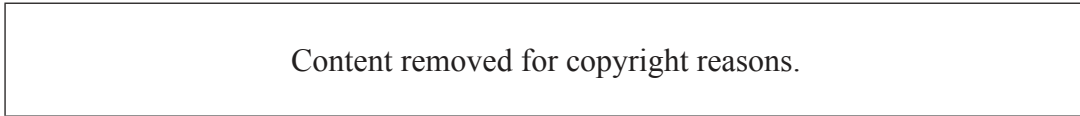
[Please refer to the diagram at http://www.pedosphere.com/resources/bulkdensity/triangle_us.cfm]

Figure 6 below shows the composition of two soil samples, Soil A and Soil B.   Soil A is classified as clay and its position is indicated on Figure 5.

Figure 6

Soil	Clay / %	Silt / %	Sand / %
A	70	10	20
B	20	40	40

(a)   With reference to Figure 5 and Figure 6, determine the classification of Soil B.   *[1]*

....

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(Question 5 continued)

(b) Deduce, giving a reason, whether Soil A or Soil B would be best for growing crops. *[1]*

The best soil for growing crops:

. . . .

Reason:

. . . .

(c) Desertification is a major environmental concern in many areas of the world. State **two** soil conservation measures that could be taken to prevent desertification. *[1]*

. . . .

. . . .

(d) State **two** transfer processes and **two** transformation processes in farming ecosystems. *[2]*

Transfer processes	Transformation processes
1.	1. . . . .
2.	2. . . . .

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(Question 5 continued)

(e)   Discuss the energy efficiency of terrestrial and aquatic food production systems.   *[3]*

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6.   (a)   In March 2010, Eyjafjallajökull (a volcano in Iceland) erupted throwing large amounts of volcanic ash into the atmosphere. Describe the possible effect of this on global temperatures.   *[2]*

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. . . .

(b)   When volcanoes erupt, they emit many gases, some of which contribute to acid deposition. List **two gases** that contribute to acid deposition.   *[2]*

1.   . . . .

2.   . . . .

(c)   Describe a direct method that may be used to monitor a **named** atmospheric pollutant.   *[3]*

Named pollutant:

. . . .

Method to monitor:

. . . .

. . . .

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