IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M03/715/S(1)

ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 1

Candidate number

Wednesday 7 May 2003 (afternoon)

1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

- Write your candidate number in the box above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions in the spaces provided. You may continue your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper using the tag provided.
- At the end of the examination, indicate the number of answer sheets used in the appropriate box on your cover sheet.

1. (a) Define the following terms.

(i) *Negative feedback* *[1]*

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(ii) *Positive feedback* *[1]*

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(b) Suggest why most ecosystems are negative feedback systems. *[1]*

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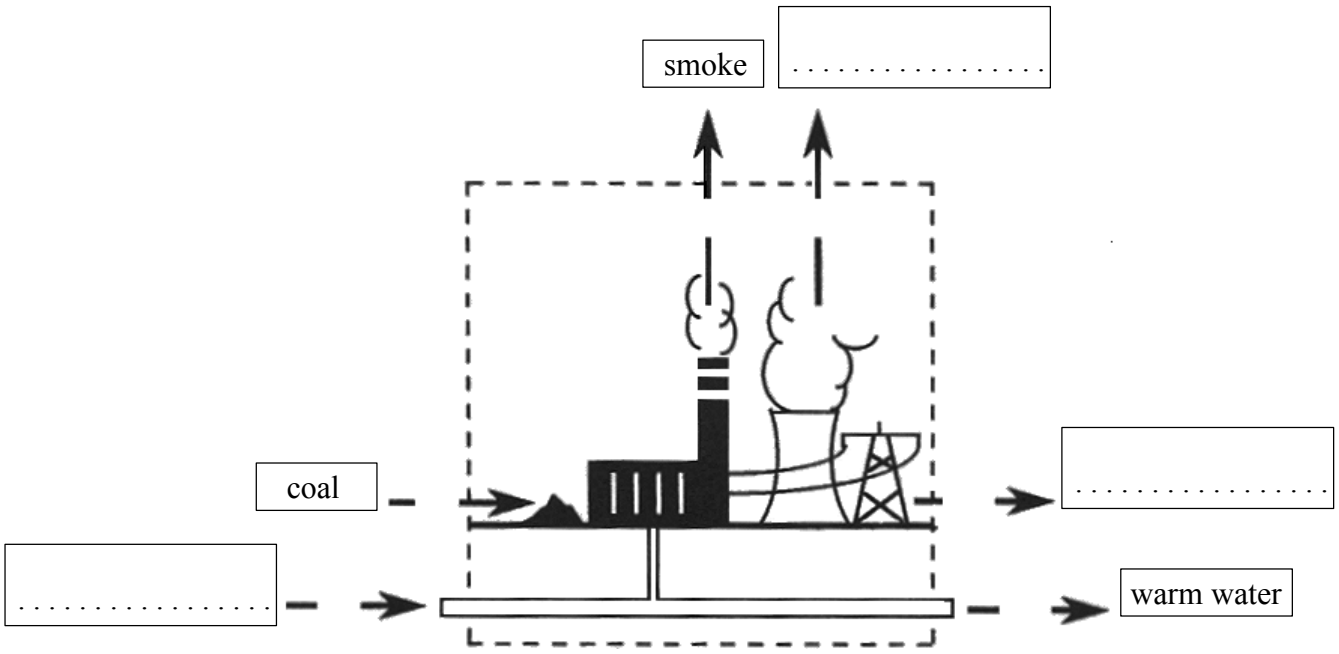
Figure 1 The diagram below represents a coal fired power station.



[Source: adapted from D D Kemp, *Global Environmental Issues, A Climatological Approach*, (1994), Routledge, page 7]

(c) Complete figure 1 by naming the missing input and the two missing outputs. *[2]*

2. (a) Define the term *biodiversity*. *[2]*

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(b) Simpson's diversity index is $D = \frac{N(N-1)}{\sum n(n-1)}$

(i) State what the symbol *n* represents in the above equation. *[1]*

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(ii) Suggest what a high *D* value indicates about an ecosystem. *[1]*

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(iii) Predict the effect on the value of *D* if the number of organism of one species increased but the total number of organisms of all other species in an ecosystem remained constant. *[1]*

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(iv) Suggest **one** reason for a low *D* value in an ecosystem. *[1]*

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(This question continues on the following page)

(Question 2 continued)

(c) (i) Outline a method for estimating plant biomass within a named ecosystem. *[3]*

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(ii) Outline a method for estimating the abundance of small mammals in a tundra environment. *[2]*

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3. (a) Define the term *species*. *[1]*

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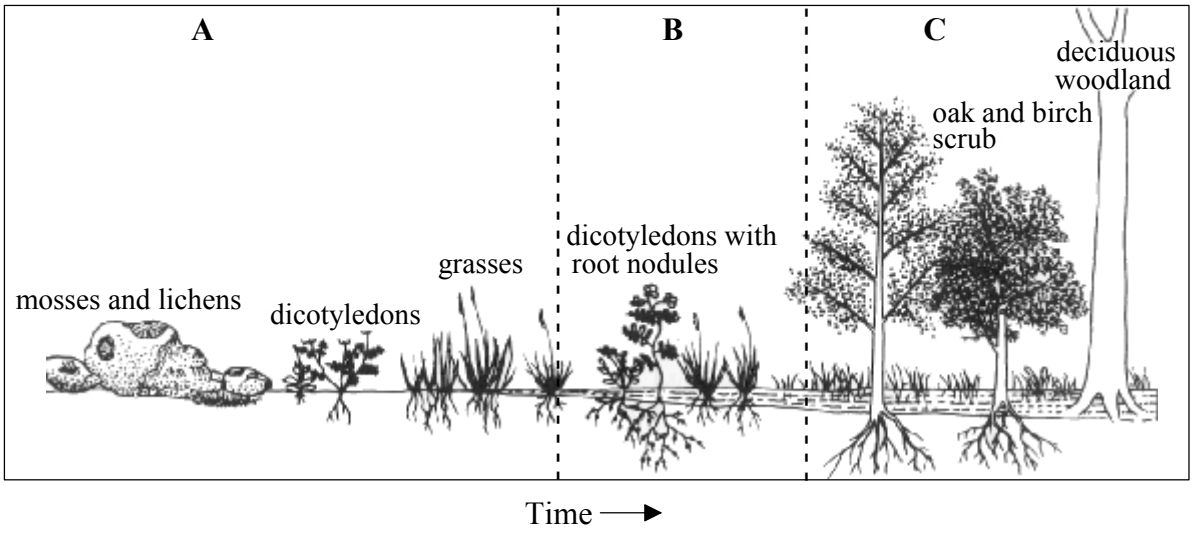
Figure 2 Vegetation change over time.



[Source: adapted from J L Chapman and M J Reiss, *Ecology Principles and Applications*, 2nd edition, (1999), CUP, page 208]

(b) (i) State the name of the process shown in figure 2. *[1]*

. . . . . .

(ii) Outline what is meant by the term *climax vegetation* and identify which part of figure 2 (A, B or C) contains climax vegetation. *[2]*

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(iii) Suggest **two** ways in which human activity could affect climax vegetation. *[2]*

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(Question 3 continued)

(c) (i) Draw "S" and "J" population growth curves on the axes below. Label each graph and the axes. *[2]*

(ii) Identify in which part of **figure 2** (A, B or C) you would expect to find species with

S population growth curves. . . . . .

J population growth curves. . . . . *[2]*

(d) Animals adopt a range of reproductive strategies.

(i) Outline the characteristics of *K*-strategy organisms and give an example of such an organism. *[2]*

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(ii) Outline the characteristics of *r*-strategy organisms and give an example of such an organism. *[2]*

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4. (a) Define the term *sustainability*. *[2]*

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(b) Identify the equation that is used to calculate sustainable yield (SY) by underlining the relevant equation. *[1]*

$$\text{SY} = \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t+1 \right) - \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right)$$

$$\text{SY} = \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right) - \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right)$$

$$\text{SY} = \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right) + \left(\frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right)$$

(c) Outline **two** factors that may undermine the ability of a country to maintain or develop a policy of sustainable development. *[3]*

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(Question 4 continued)

(d) (i) Distinguish between *renewable* and *non-renewable* (natural capital) resources. *[2]*

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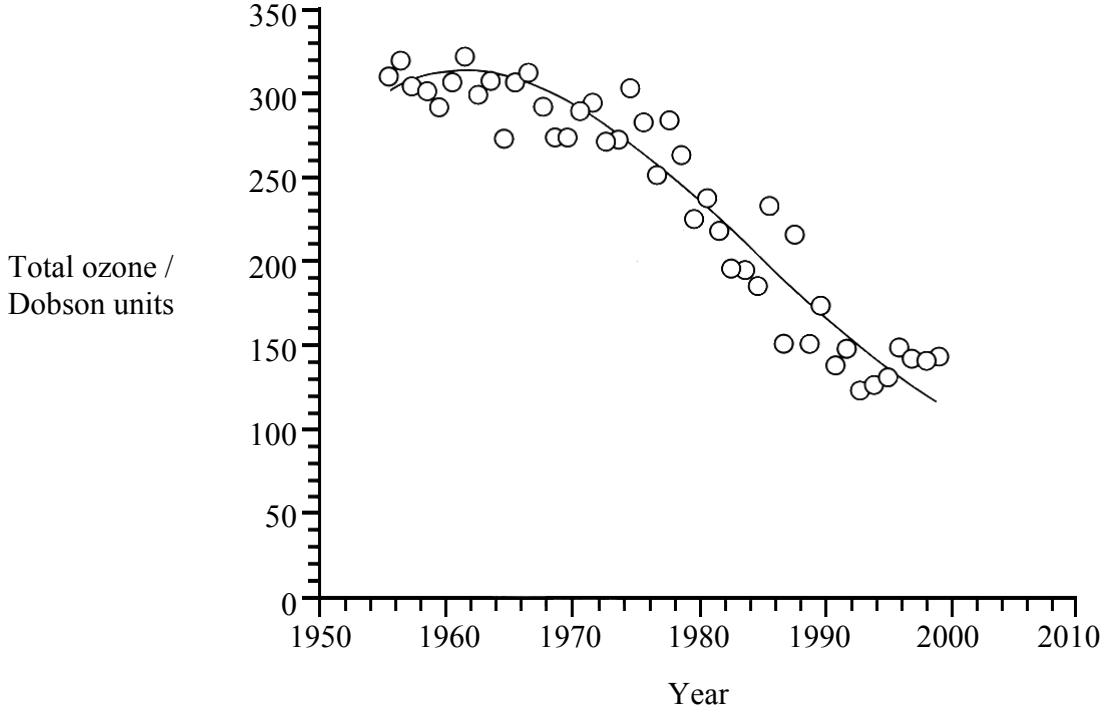
(ii) Complete figure 3 by classifying the following resources as renewable or non-renewable. *[2]*

coal, gas, groundwater, wind, oil, wood, solar radiation, natural ore, food crops, soil

Figure 3

Renewable / replenishable	Non-renewable

5. **Figure 4** Mean October ozone concentrations recorded at the Halley research station, Antarctica, over a 45 year period.



[Source: J Shanklin, British Antarctic Survey, in *Climate Change*, 2001, Royal Society of Chemistry]

(a) (i) Describe the trend in ozone concentration in figure 4. *[1]*

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(ii) Suggest reasons for the trend you have described in (a) (i). *[2]*

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(b) Outline the role of ozone in the absorption of ultraviolet (UV) radiation. *[2]*

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(Question 5 continued)

(c) State **one** negative consequence to humans of exposure to UV radiation and **one** negative consequence to plants. *[2]*

Humans . . . . . .

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Plants . . . . . .

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(d) Outline **three** methods of reducing the quantity of ozone depleting substances in the environment. *[3]*

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3 . . . . . .

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