Diploma Programme
Programme du diplôme
Programa del Diploma

# Environmental systems and societies
# Standard level
# Paper 1

Wednesday 18 May 2016 (morning)

1 hour

Candidate session number

| | | | | | | | | | |
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**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]**.

2216 – 6301

15 pages

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

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(b) The four species shown in **Figure 1** can be found in wetland ecosystems.

**Figure 1**

**Oystercatcher** *(Haematopus ostralegus)*

[Source: Andreas Trepte, www.photo-natur.de]

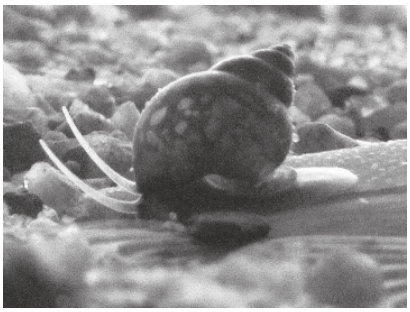
**Avocet** *(Recurvirostra avosetta)*

[Source: Photo by Andreas Trepte, www.photo-natur.de]

**Crested Newt** *(Triturus cristatus)*

[Source: https://en.wikipedia.org/wiki/Northern_crested_newt#/media/File:Kammmolchmaennchen.jpg, by Rainer Theuer]

**Bithynia** *(Bithynia tentaculata)*



[Source: https://en.wikipedia.org/wiki/Bithynia_tentaculata#/media/File:Bithynia_tentaculata.jpg, by Michal Maňas]

**(This question continues on the following page)**

**(Question 1 continued)**

(i) Construct a classification key to identify these animals by entering appropriate contrasting features and the names of the organisms to complete the table below: [2]

| Row | Paired contrasting features | Name of organisms |
|---|---|---|
| **1** | Body covered with feathers . . . . . .<br>Body not covered with feathers . . . . . | Go to row **2**<br>Go to row **3** |
| **2** | . . . . . .<br>. . . . . | Name: . . . . . .<br>Name: . . . . . |
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(ii) State **one** limitation of using a key to identify organisms. [1]

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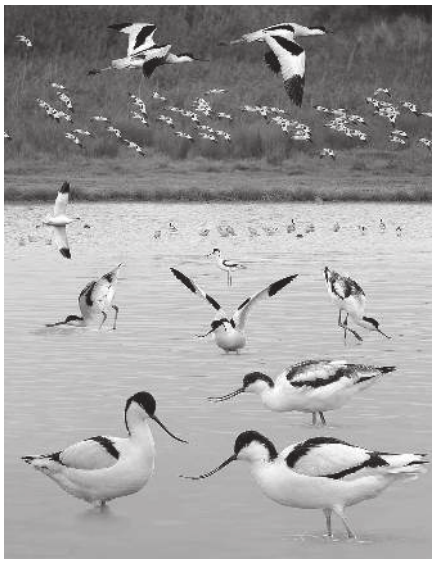
**(Question 1 continued)**

(c) Avocets, seen in **Figure 2**, often gather in large populations of up to a few thousand birds before migrating.

**Figure 2**



[Source: https://en.wikipedia.org/wiki/Pied_avocet#/media/File:Avocet_from_the_Crossley_ID_Guide_Britain_and_Ireland.jpg, by Richard Crossley — The Crossley ID Guide Britain and Ireland]

Describe a method to estimate the size of an avocet population. [3]

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**(Question 1 continued)**

(d) Oystercatchers and avocets both feed on small animals in the mud of the wetlands. State the most likely relationship between these two species. [1]

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(e) *Bithynia* feeds on plant material in the wetland ecosystem.

(i) State its trophic level in the ecosystem. [1]

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(ii) Describe its role in the carbon cycle of the system. [2]

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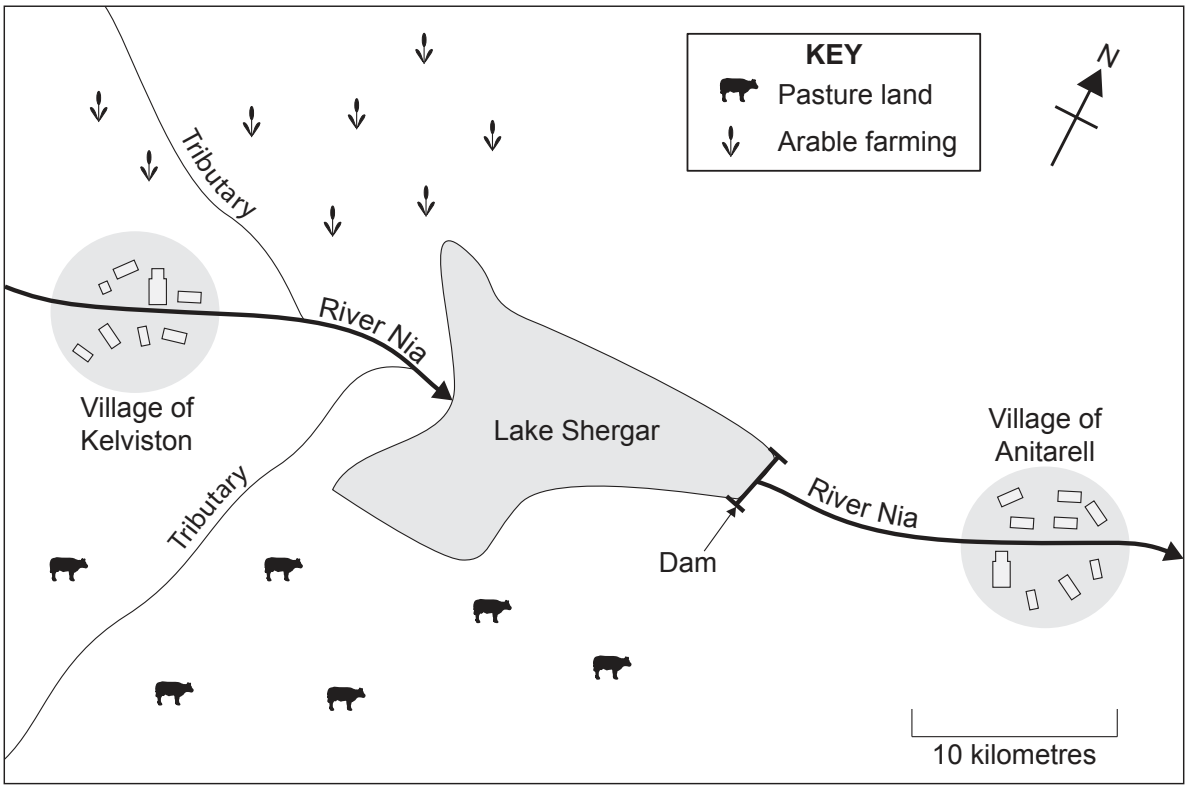
**2.** **Figure 3:** A simplified diagram of the Lake Shergar area.

**Figure 3**




[Source: © International Baccalaureate Organization 2016]

(a) The lake provides a water supply for the local population.

(i) Outline why this lake may be considered an open system. [1]

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(ii) Identify **two** outputs from this lake. [1]

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**(Question 2 continued)**

(iii) With reference to Lake Shergar, explain what is meant by natural income. [2]

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(iv) With reference to the cattle in the area, explain how the maximum sustainable yield could be calculated. [2]

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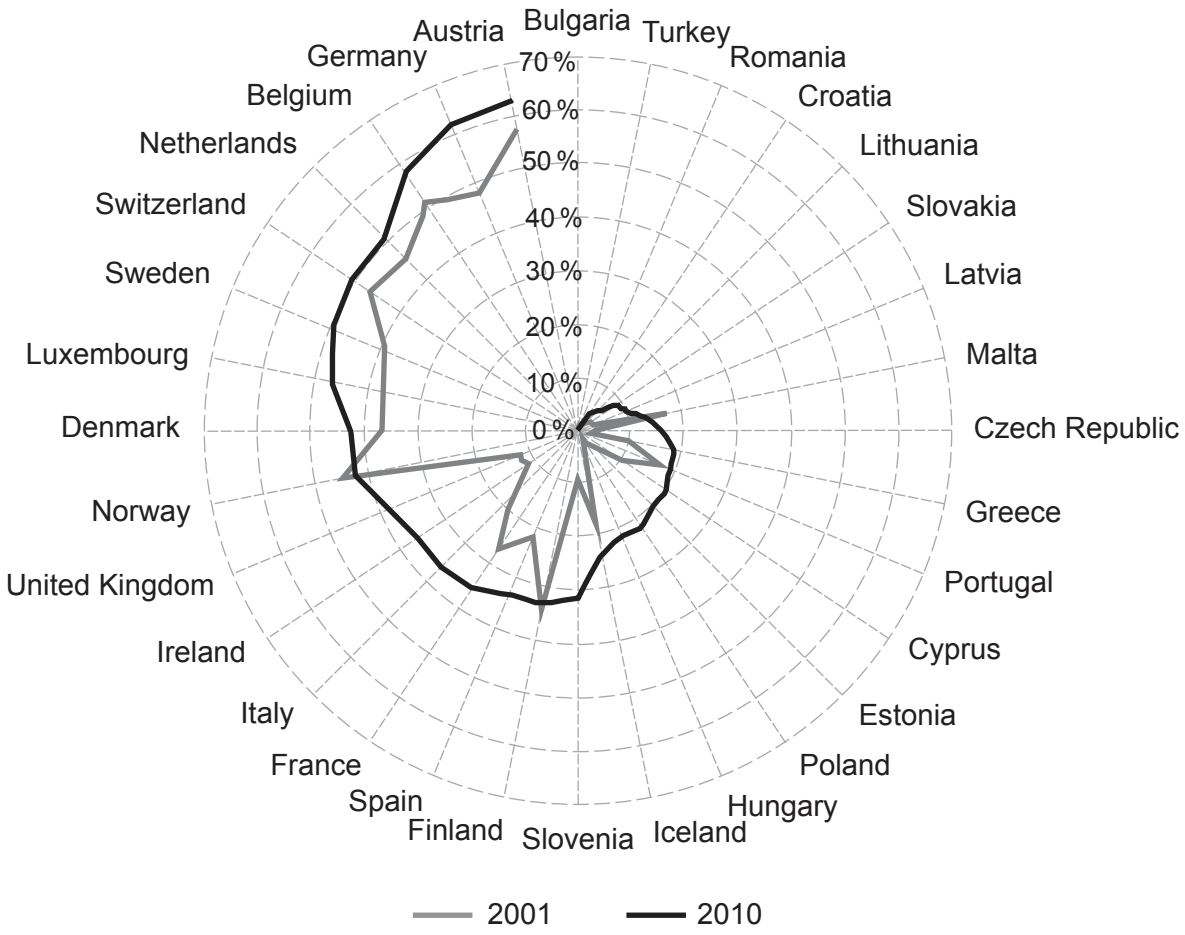
(v) Nitrates and phosphates from nearby farms may drain into the lake. Identify a strategy for managing this pollution at each of the following levels: [3]

| **Level of management** | **Management strategy** |
|---|---|
| Reducing production of pollutant. | . . . . . |
| Reducing release of pollutant into lake. | . . . . . |
| Restoring impacts of pollution. | . . . . . |

**3.** **Figure 4:** The figure shows changes in the amount of municipal waste recycled as a percentage of total generated waste in 32 European countries in 2001 and 2010.

**Figure 4**




[Source: adapted from http://na.unep.net]

(a) (i) State the trend shown in the percentage of waste recycled between 2001 and 2010. [1]

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**(Question 3 continued)**

(ii) Identify **two** countries that have not followed this general trend. [1]

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(iii) Identify **one** reason why some countries may have not followed this trend. [1]

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(b) Evaluate the use of incineration as an alternative to recycling for the management of solid waste. [5]

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**4.** **Figure 5:** Ecological footprints (EF) for China and the USA between 1961 and 2010.

**Figure 5**

**China** **USA**

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(a) (i) Outline **one** reason for the difference between the ecological footprints of China and the USA in 2010. [1]

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(ii) Outline **two** possible reasons for changes in China's ecological footprint between 1961 and 2010. [2]

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(iii) Explain **one** advantage of using ecological footprint as a model for assessing sustainability. [2]

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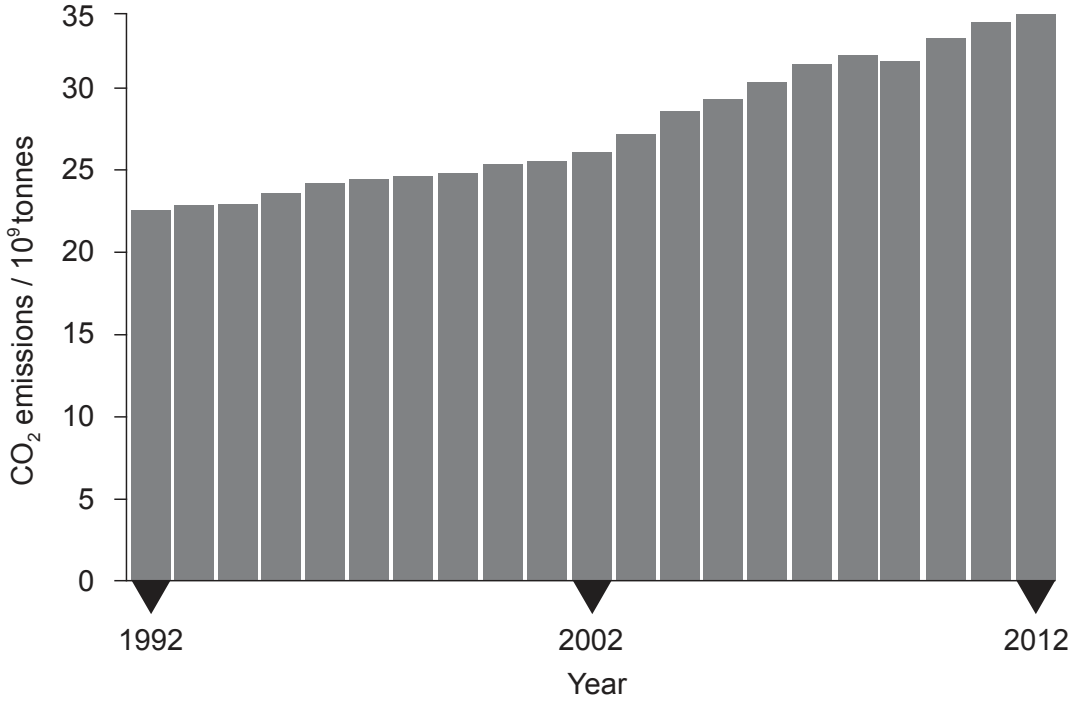
**5.** **Figure 6:** The graph below shows the global $CO_2$ emissions from 1992 to 2012.

**Figure 6**




[Source: Adapted from http://infographics.pbl.nl, PBL Netherlands Environmental Assessment Agency]

(a) (i) Calculate the percentage increase of global $CO_2$ emissions from 1992 to 2012. [1]

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(ii) $CO_2$ is considered a greenhouse gas. Identify **two** other greenhouse gases. [2]

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**(Question 5 continued)**

(b) Natural systems achieve equilibrium through feedback systems. Explain how feedback mechanisms would be associated with an increase in mean global temperature. [2]

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**6.** (a) Human activities affect the concentration of both stratospheric and tropospheric ozone.

Outline the differences in these two effects by completing the following table. [2]

| | **Stratospheric ozone** | **Tropospheric ozone** |
|---|---|---|
| Change in concentration | Increase | Increase |
| Cause of change in concentration: | . . . . . | . . . . . |
| Impact on humans: | . . . . . | . . . . . |

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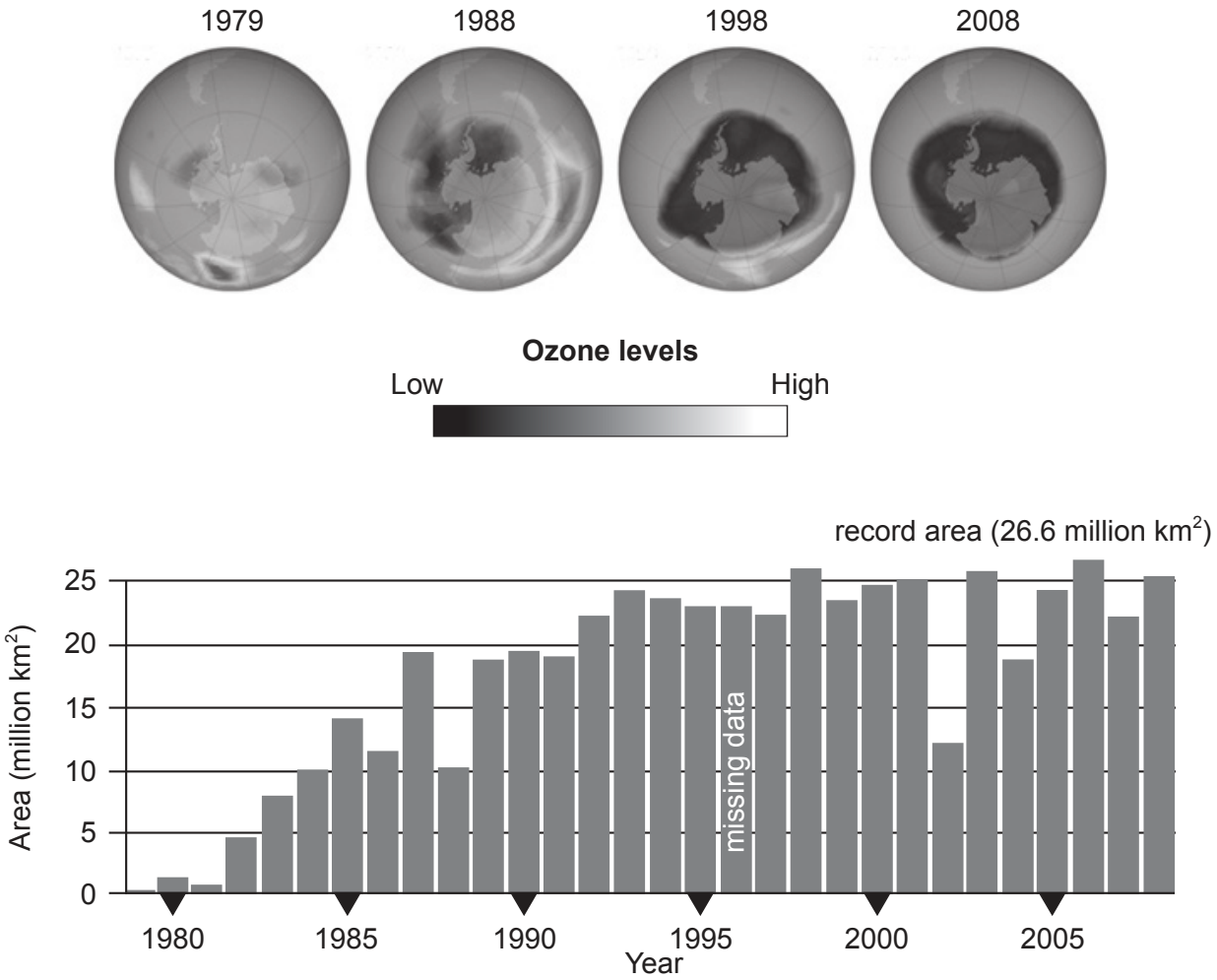
Answers written on this page will not be marked.

**(Question 6 continued)**

(b) Images from space and measurements have allowed scientists to estimate changes in the ozone hole.

**Figure 7:** Changes in the ozone hole from 1979 to 2008.

**Figure 7**




[Source: http://earthobservatory.nasa.gov/Features/EarthPerspectives/page3.php]

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**(Question 6 continued)**

Including reference to this data, evaluate the effectiveness of the Montreal Protocol (1987) in managing ozone depletion. [5]

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Answers written on this page will not be marked.