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

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]

. . . . . .

. . . . . .

(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]

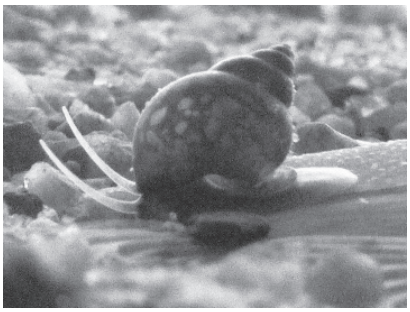
Avocet *(Recurvirostra avosetta)*

[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]

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(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 . . . . . . Body not covered with feathers	Go to row **2** Go to row **3**
2	. . . .	Name: . . . . . . Name: . . . . .
3	. . . .	Name: . . . . . . Name: . . . . .

(ii) State **one** limitation of using a key to identify organisms. [1]

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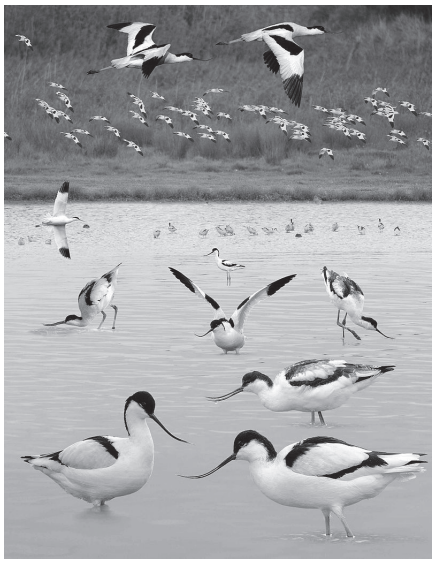
(Question 1 continued)

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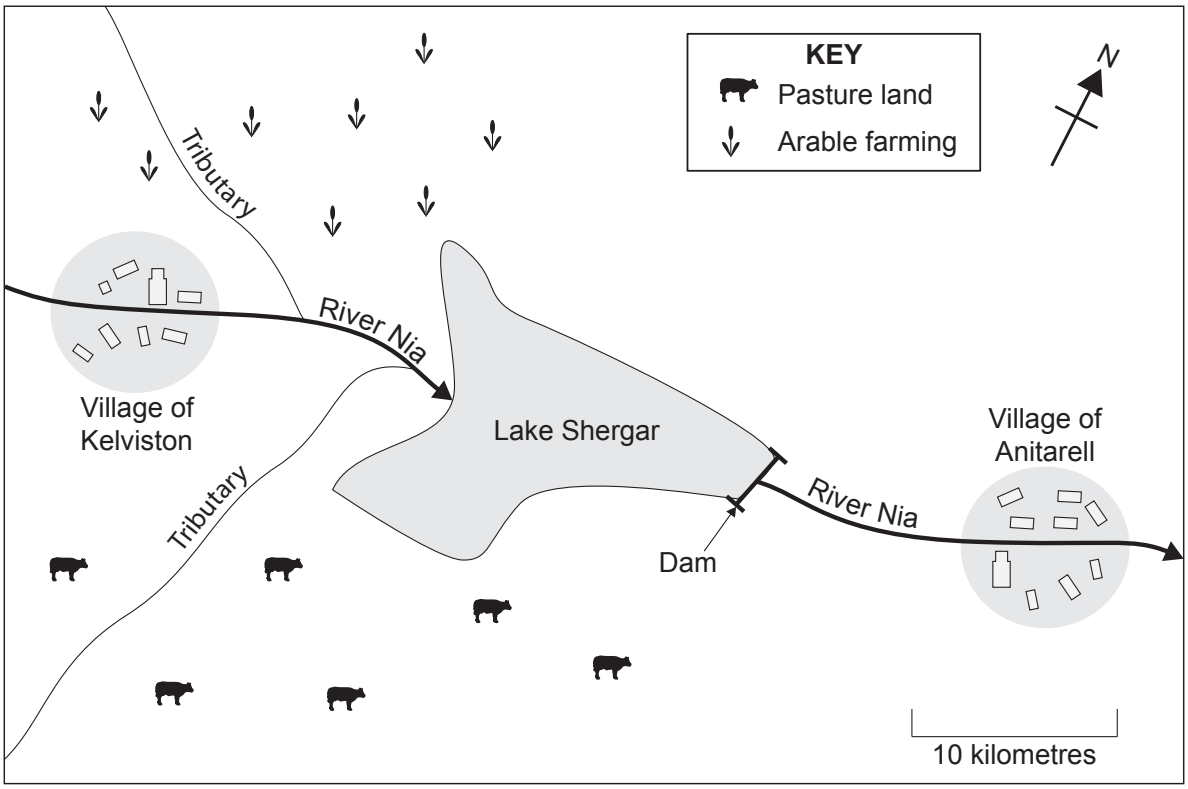
2. **Figure 3:** A simplified diagram of the Lake Shergar area.

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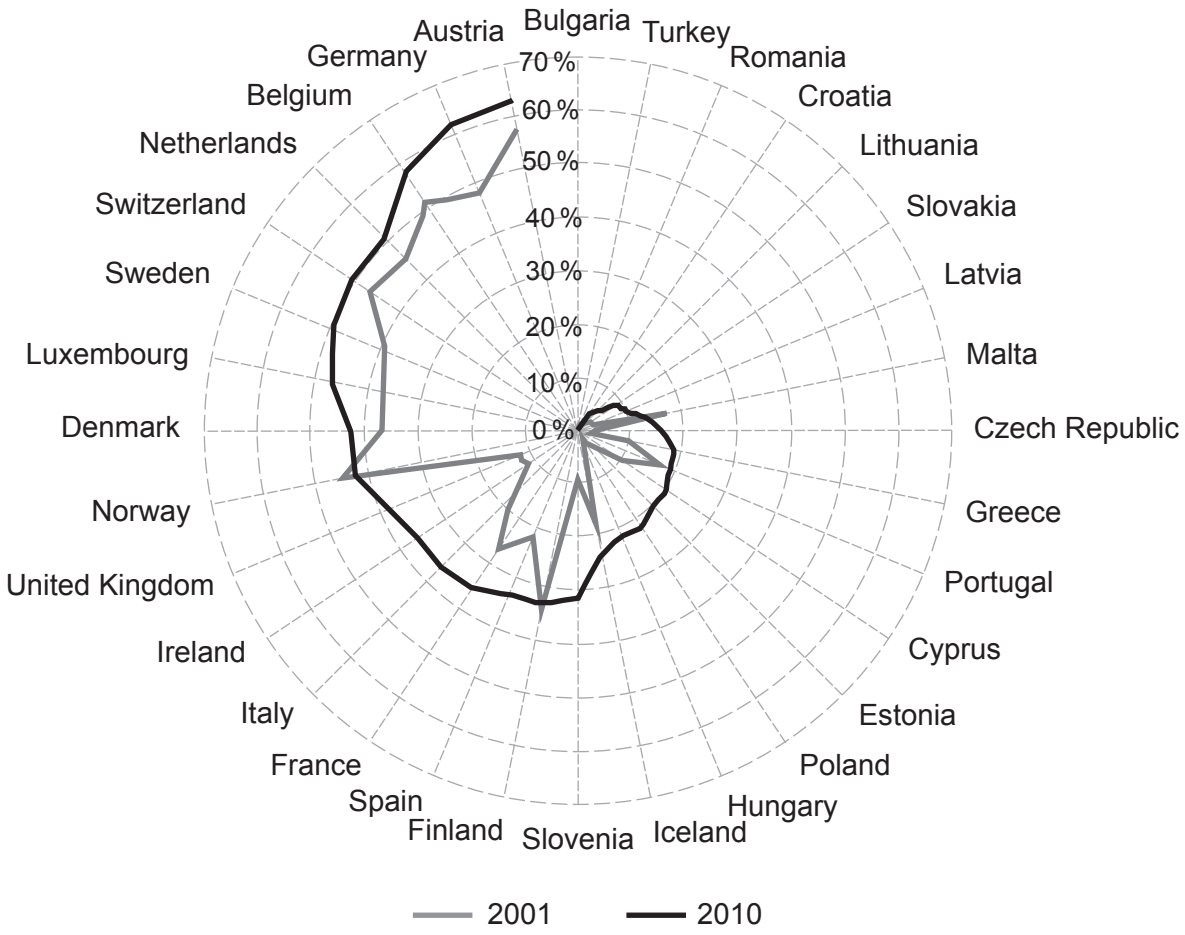
(v) Nitrates and phosphates from nearby farms may drain into the lake. Identify a strategy for managing this pollution at each of the following levels: [3]

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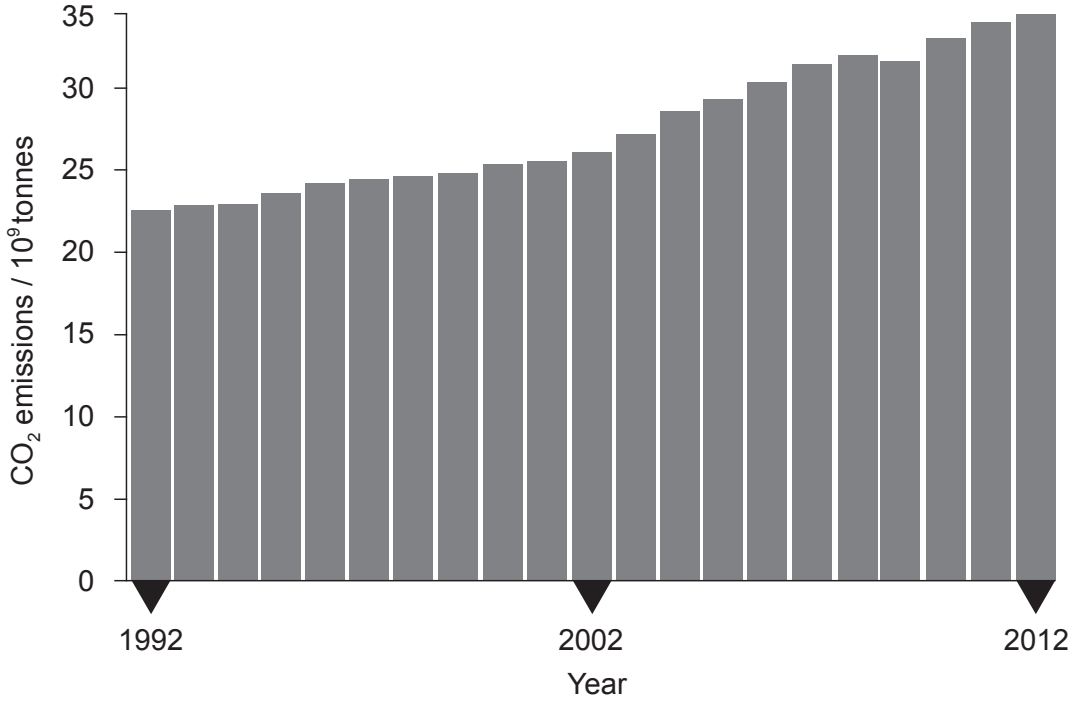
5. **Figure 6:** The graph below shows the global CO_2 emissions from 1992 to 2012.

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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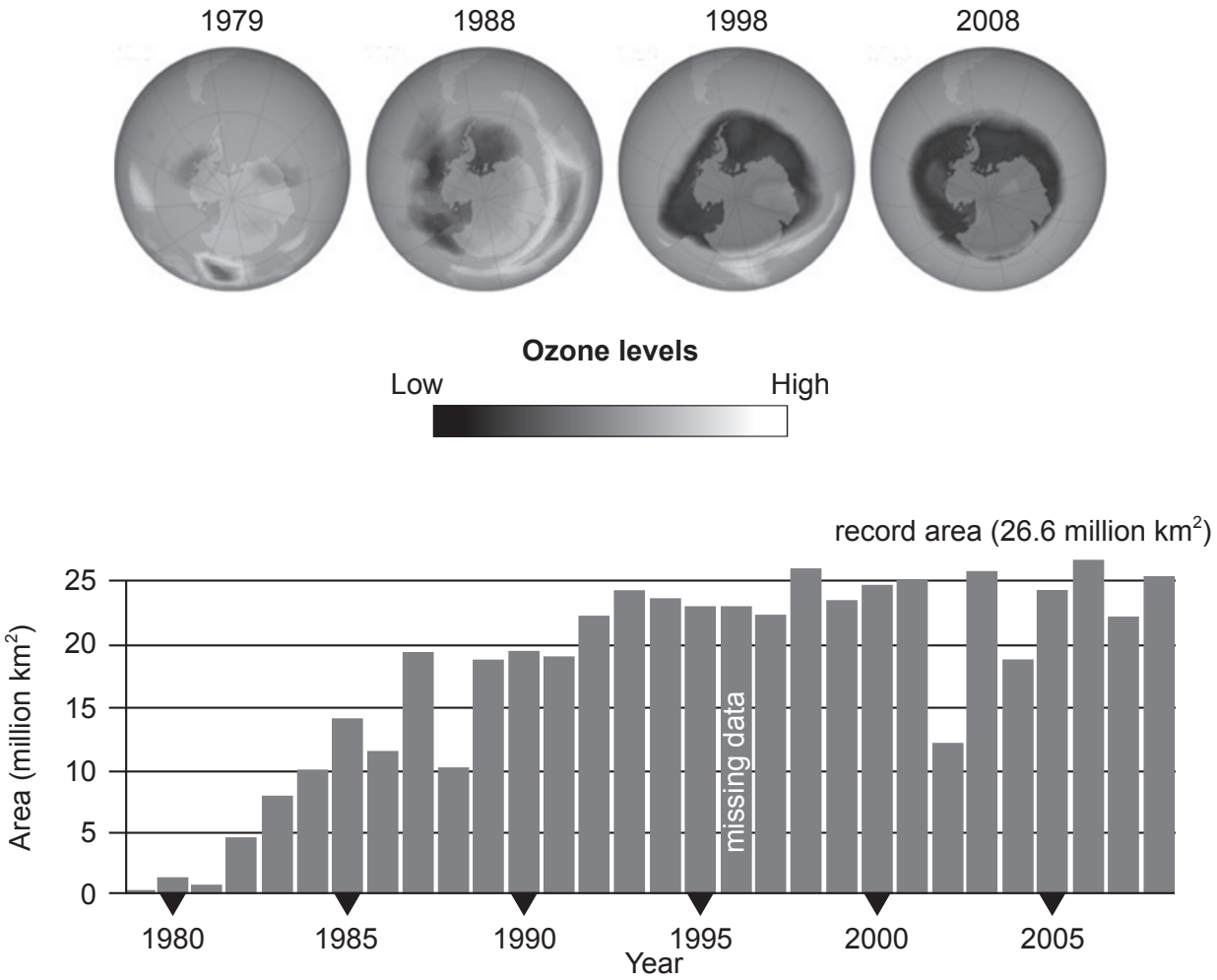
(Question 6 continued)

(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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