

Environmental systems and societies
Standard level
Paper 2

Monday 8 May 2017 (morning)

Candidate session number

2 hours

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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.
- Section A: answer all questions.
- Section B: answer two questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[65 marks]**.

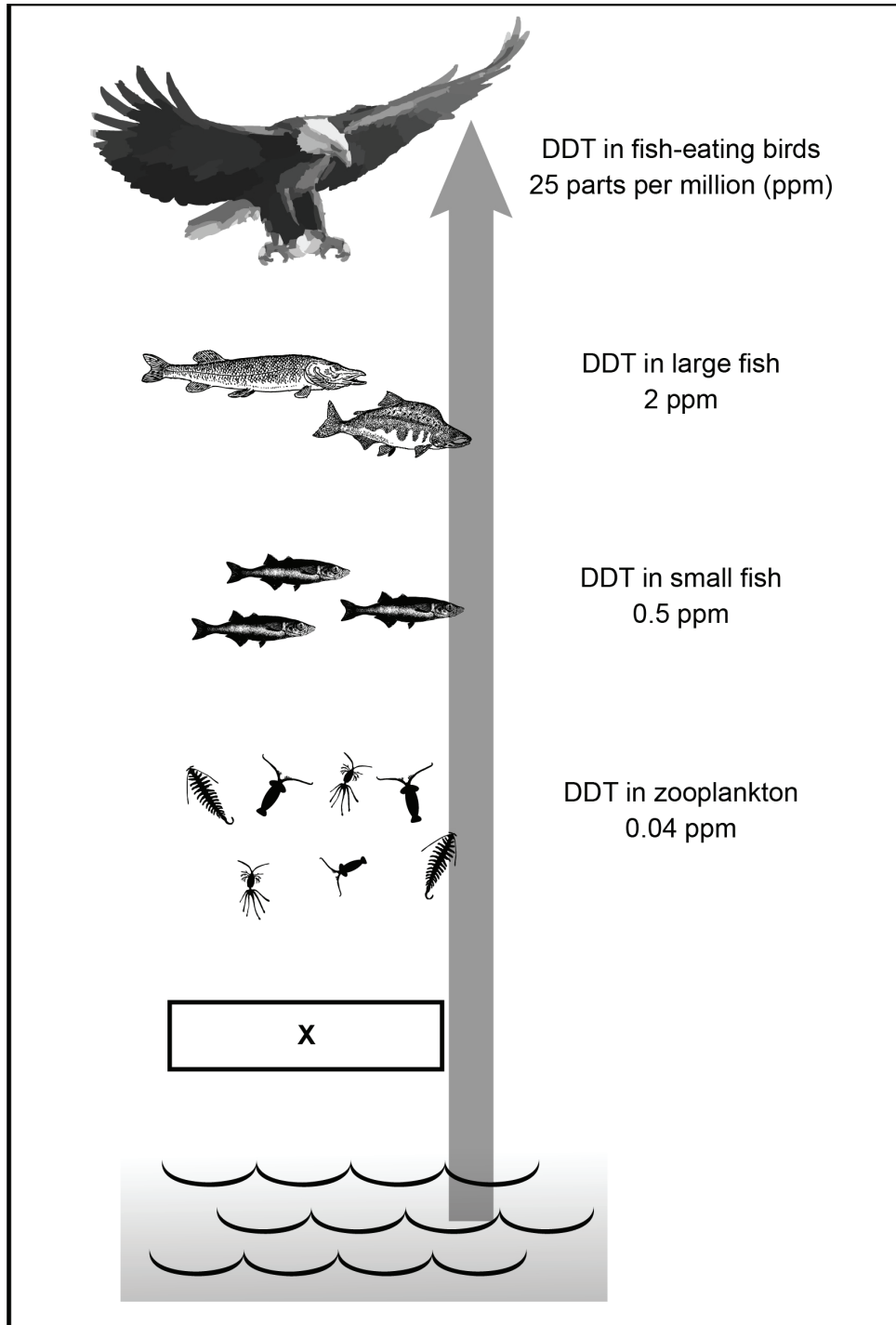


Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

1. The concentration of DDT at different trophic levels of the food chain.

Figure 1: Levels of concentration of DDT in food chain



[Source: © International Baccalaureate Organization, 2017]

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(Question 1 continued)

(a) State the main source of energy for the food chain in **Figure 1**. [1]

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(b) State the trophic level labelled **X** in **Figure 1**. [1]

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(c) Identify **one** use of DDT that has led to its presence in the environment. [1]

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(d) With reference to the concepts of bioaccumulation **and** biomagnification, outline how the concentration of DDT has changed along the food chain. [2]

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Answers written on this page will not
be marked.



(Question 1 continued from page 3)

(e) (i) State the relationship between large and small fish in **Figure 1**. [1]

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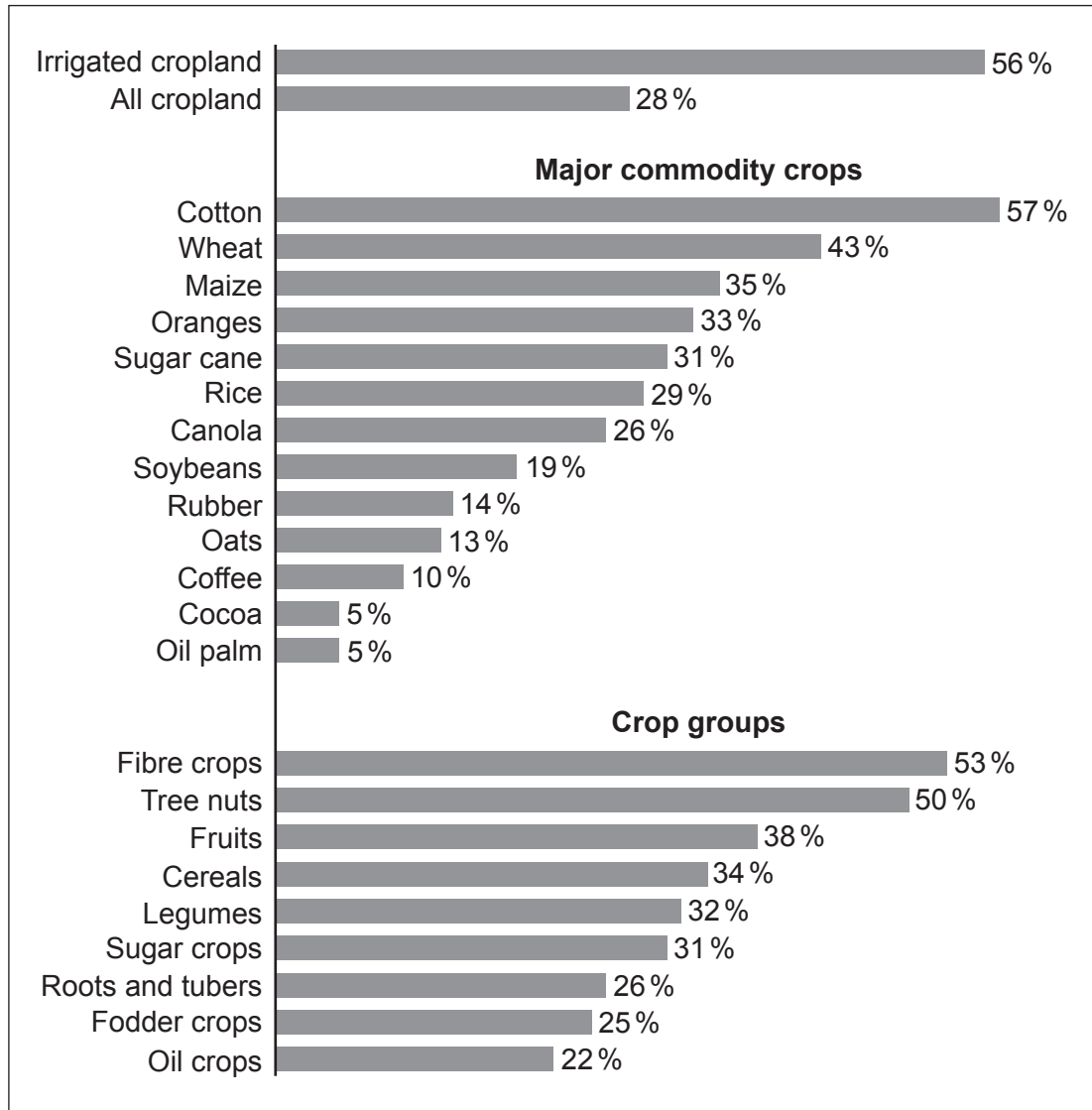
(ii) Outline how this relationship may be of benefit to the populations of both species. [2]

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2. *Water stress* is the total annual extraction of water as a proportion of the renewable supply in a given area. If the extraction represents 40 % or more of the available supply it is described as a high risk area.

Figure 2: Water stress for selected crops



[Source: World Resources Institute, <http://www.wri.org/resources/charts-graphs/portion-agricultural-production-under-high-or-extremely-high-stress>. Used with permission.]

- (a) State the crop that is under the greatest water stress.

[1]

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(Question 2 continued)

(b) Identify **two** strategies that could be used to grow crops in areas of high water stress. [2]

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(c) Identify **three** factors that may lead to an increase in water stress. [3]

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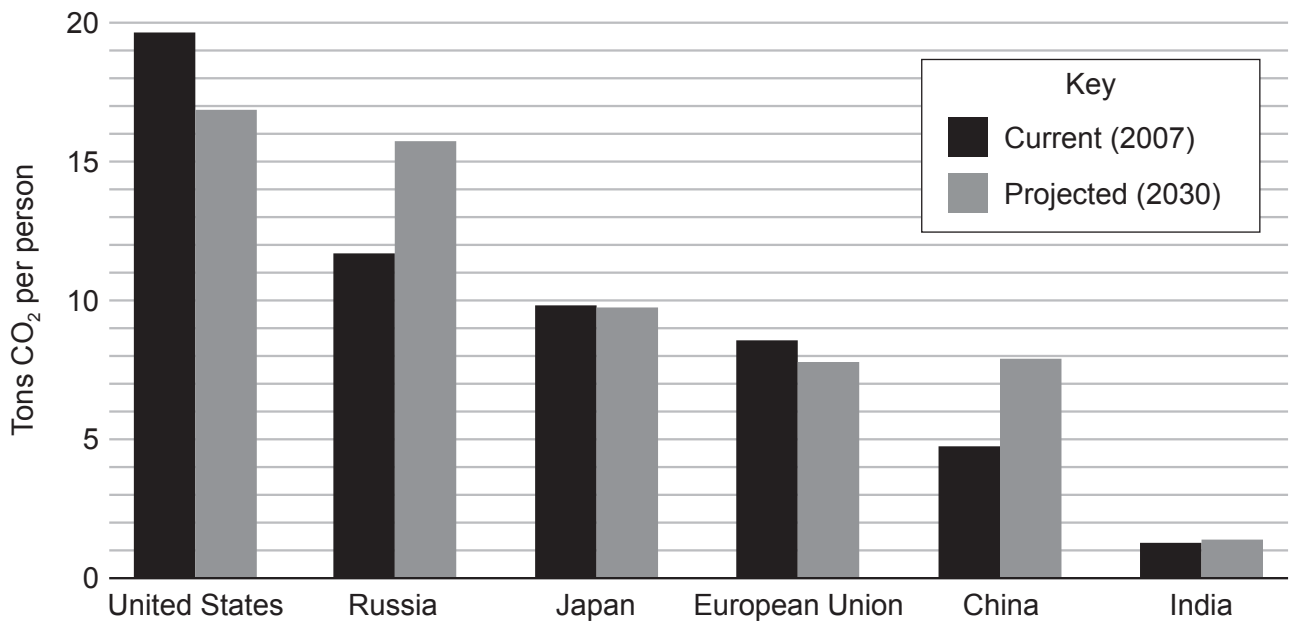
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3. There are concerns that increased carbon dioxide (CO₂) emissions are leading to changes in the global climate.

Figure 3: CO₂ emissions for select countries in 2007 and 2030 (Projected)



[Source: World Resources Institute, <http://www.wri.org/resources/charts-graphs/capita-co2-emissions-select-major-emitters-2007-and-2030-projected>. Used with permission.]

- (a) Calculate the projected percentage increase from 2007 to 2030 in CO₂ emissions for Russia. [1]

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- (b) Outline how CO₂ emissions may cause a change in the global climate. [2]

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(Question 3 continued)

(c) Identify **two** possible reasons for the projected change in CO₂ emissions for China. [2]

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(d) Identify **one** reduction strategy that the United States might use to achieve its projected change in CO₂ emissions. [1]

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(e) Identify **one** adaptation strategy that could be used to reduce the impacts of climate change. [1]

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(Question 3 continued)

- (f) Explain how the ability to implement mitigation and adaptation strategies may vary from one country to another.

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Section B

Answer **two** questions. Answers must be written within the answer boxes provided.

4. (a) Identify **four** ways in which solar energy reaching vegetation may be lost from an ecosystem before it contributes to the biomass of herbivores. [4]
- (b) Suggest a series of procedures that could be used to estimate the net productivity of an insect population in $\text{kg m}^{-2} \text{yr}^{-1}$. [7]
- (c) To what extent are the concepts of *net productivity* and *natural income* useful in managing the sustainable harvesting of named resources from natural ecosystems? [9]
5. (a) Identify **four** characteristics of ecosystems that contribute to their resilience. [4]
- (b) Explain how positive feedback mechanisms may influence the equilibrium of an aquatic ecosystem during the process of eutrophication. [7]
- (c) Pollution management strategies may be aimed at either **preventing** the production of pollutants or **limiting** their release into ecosystems.
- With reference to **either** acid deposition **or** eutrophication, evaluate the relative efficiency of these two approaches to management. [9]
6. (a) The soil system includes storages of inorganic nutrients.
- (i) Identify **two** inputs to these storages. [2]
- (ii) Identify **two** outputs from these storages. [2]
- (b) Solid domestic waste may contain non-biodegradable material and toxins that have the potential to reduce the fertility of soils.
- Explain how strategies for the management of this waste may help to preserve soil fertility. [7]
- (c) The provision of food resources and assimilation of wastes are two key factors of the environment that determine its carrying capacity for a given species.
- To what extent does the human production of food and waste each influence the carrying capacity for human populations? [9]



- 7. (a) Identify **four** reasons why the genetic diversity of a population may change over time. [4]
- (b) Explain how changes in the concentration of stratospheric and tropospheric ozone in the atmosphere can affect global biodiversity. [7]
- (c) Environmental value systems differ in how they view the importance of biodiversity and this could influence a community's approach to conservation.

Discuss how these different perspectives, including your own, may influence approaches to conservation. [9]

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24EP20

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24EP21

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