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Diploma Programme
Programme du diplôme
Programa del Diploma

Environmental systems and societies
Standard level
Paper 2

8 May 2023

Zone A morning | **Zone B** afternoon | **Zone C** morning

Candidate session number

2 hours

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]**.

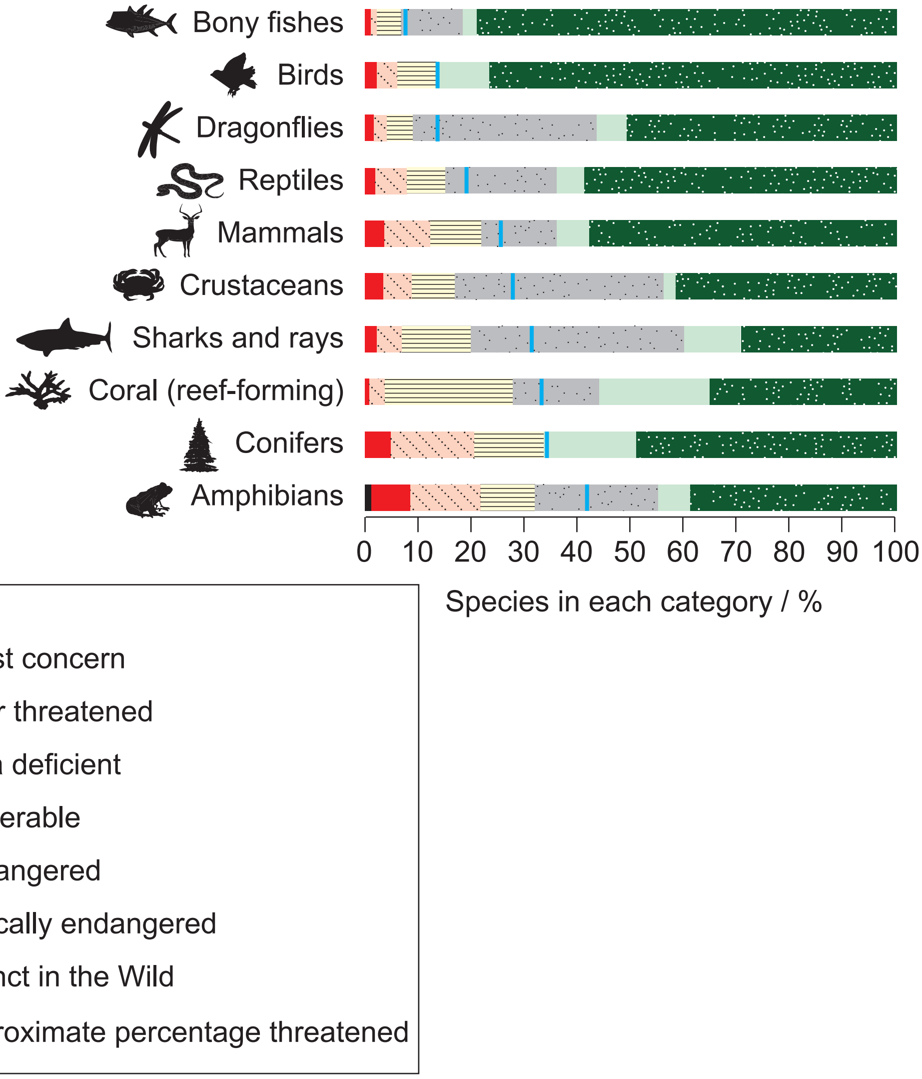
23 pages

Section A

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

1.

Figure 1(a): Extinction risk levels of species in global biodiversity by category



(a) State the category with the highest percentage of vulnerable species in **Figure 1(a)**. [1]

(This question continues on the following page)

(Question 1 continued)

(b) Outline **two** reasons why Amphibians have the highest percentage of critically endangered species in **Figure 1(a)**. [2]

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(c) Using **Figure 1(a)**, state the approximate percentage of threatened crustaceans. [1]

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(d) Describe **one** reason for the lack of available data for crustaceans. [1]

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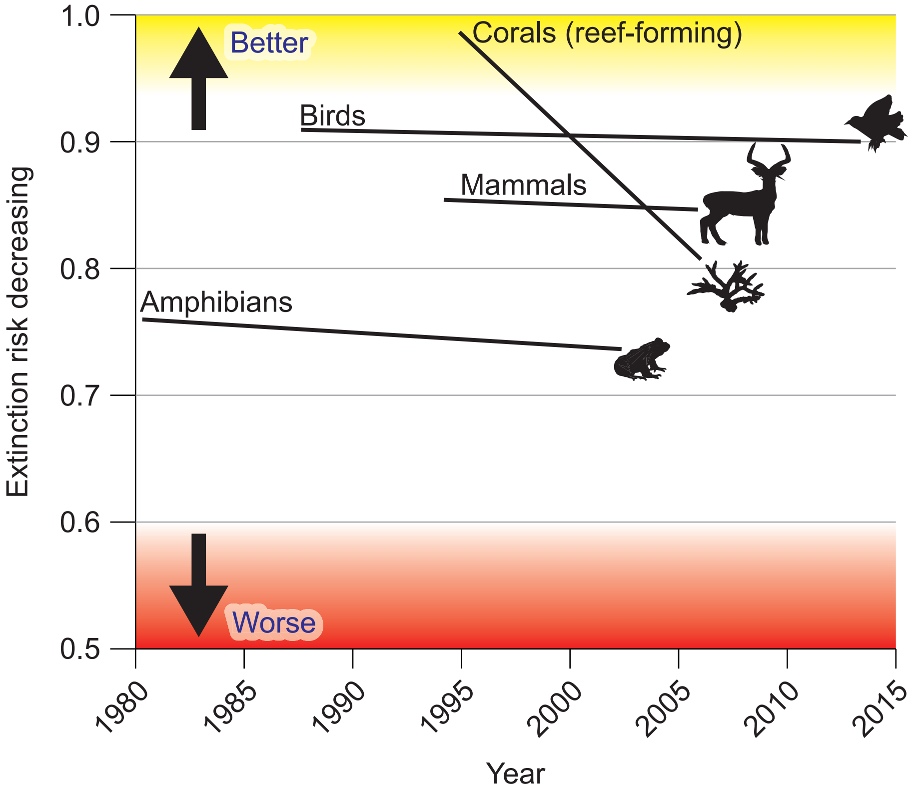
Answers written on this page
will not be marked.

(Question 1 continued)

Figure 1(b): Changing species extinction risk by category 1980–2015



(e) Outline **three** reasons why the trend for corals is different to the other categories shown in **Figure 1(b)**. [3]

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(f) **Figures 1(a)** and **1(b)** are based on records for species diversity. Identify **one** other factor that may be measured to assess the diversity of life on Earth. [1]

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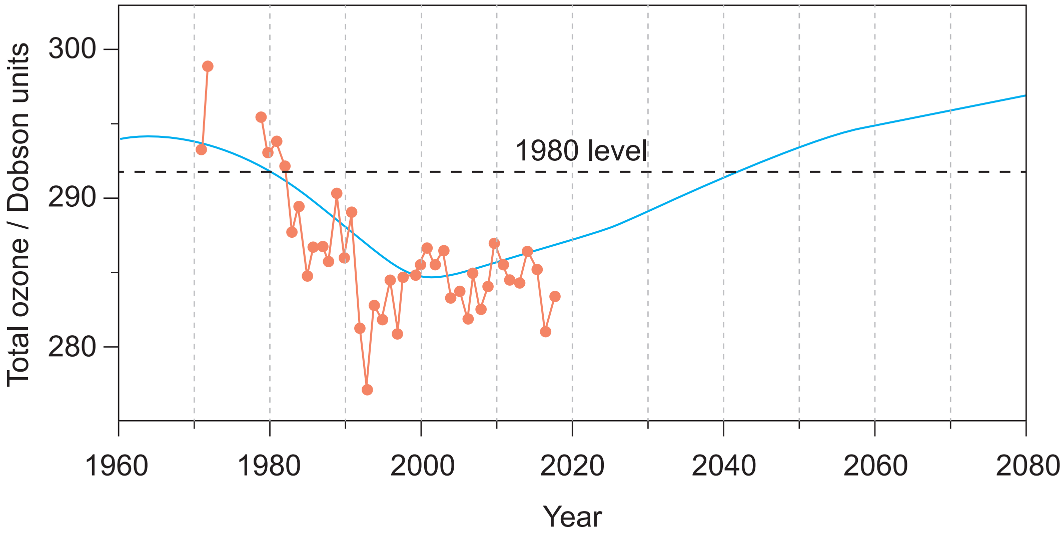
2.

Figure 2: Observed and projected changes in global stratospheric ozone



Key:

● Annually averaged data

— Average of atmospheric model projections

(a) Describe the overall trend shown in the recorded annually averaged data in **Figure 2**. [2]

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(b) State **one** chemical responsible for the trend in the recorded annually averaged data between 1980 and 1990 shown in **Figure 2**. [1]

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(c) Outline **one** impact of low concentrations of stratospheric ozone on humans. [1]

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(This question continues on the following page)

(Question 2 continued)

(d) Identify the year that stratospheric ozone is predicted to return to 1980 levels in **Figure 2**. [1]

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(e) Describe **two** reasons for the projected change in ozone levels after 2020 in **Figure 2**. [2]

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(f) Outline **one** factor that may affect the reliability of the model projections in **Figure 2**. [1]

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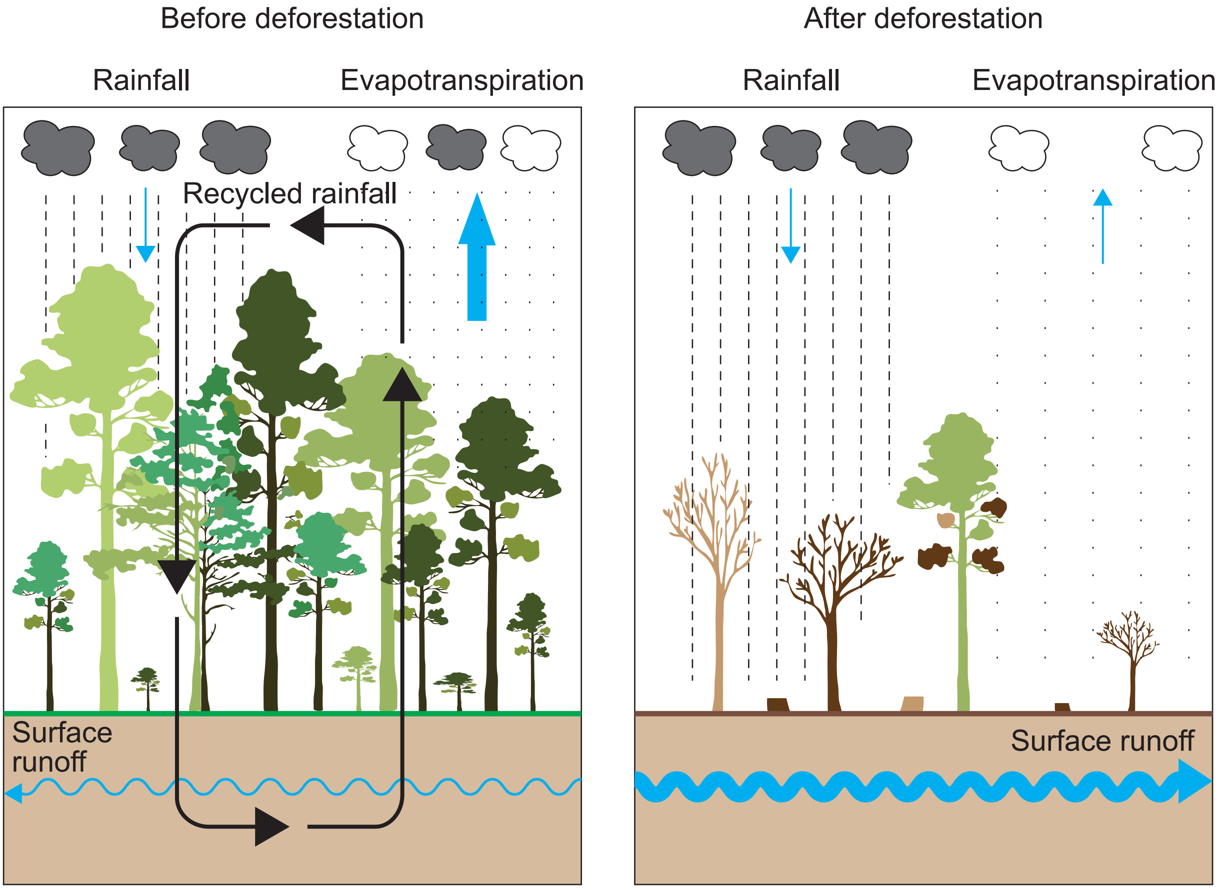
3.

Figure 3: Impact of deforestation on the water cycle



(a) State **one** storage of fresh water not shown in **Figure 3**. [1]

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(b) State **one** input of water into the atmosphere not shown in **Figure 3**. [1]

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(This question continues on the following page)

(Question 3 continued)

(c) Describe the positive feedback mechanism by which deforestation may decrease the availability of water in certain regions. [2]

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(d) Evaluate the role of reforestation in the mitigation of climate change. [4]

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Section B

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

4. (a) Outline the transfers and transformations of matter as it enters and flows through the first trophic level of a food chain. [4]

(b) Describe how the emissions from the combustion of fossil fuels may impact the productivity of terrestrial ecosystems. [7]

(c) With reference to named societies, to what extent do the environmental impacts of energy resources influence their choice of energy? [9]

5. (a) With reference to **four** named agricultural strategies, outline how they improve the sustainable use of soils. [4]

(b) Explain how the process of succession leads to changes in productivity. [7]

(c) With reference to named examples, compare and contrast wild fisheries and aquaculture systems in terms of their efficiency and environmental impacts. [9]

6. (a) A new parasite is introduced into an ecosystem and manages to infect a host species. Outline how the host and parasite species may reach an equilibrium over time. [4]

(b) Explain how tectonic plate activity may lead to the formation of new species. [7]

(c) Justify the role of different environmental value systems (EVSs) in deciding between species based and habitat based conservation strategies. [9]

7. (a) Outline how the ecological footprint (EF) of a human population is likely to change through the stages of the demographic transition model (DTM). [4]

(b) A wild population of fish may provide a sustainable resource for human consumption. Describe practical procedures for estimating the maximum sustainable yield from such a resource. [7]

(c) To what extent do different strategies for the management of solid domestic waste (SDW) influence the sustainability of human populations? [9]

References:

Figure 1(a)	IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673. Creative Commons 4.0 Attribution 4.0 International (CC BY 4.0) https://creativecommons.org/licenses/by/4.0/. (source adapted - Image A Pg. XX redrawn).
Figure 1(b)	IPBES (2019): Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. https://doi.org/10.5281/zenodo.3831673. Creative Commons 4.0 Attribution 4.0 International (CC BY 4.0) https://creativecommons.org/licenses/by/4.0/. (source adapted – Image C Pg. XX redrawn).
Figure 2	Ross J. Salawitch (Lead Author), David W. Fahey, Michaela I. Hegglin, Laura A. McBride, Walter R. Tribett, Sarah J. Doherty, Twenty Questions and Answers About the Ozone Layer: 2018 Update, Scientific Assessment of Ozone Depletion: 2018, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2019.