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Environmental systems and societies

Higher level

Paper 2

4 May 2026

Zone A morning | Zone B morning | Zone C morning

Session number

2 hours 30 minutes

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Instructions to students

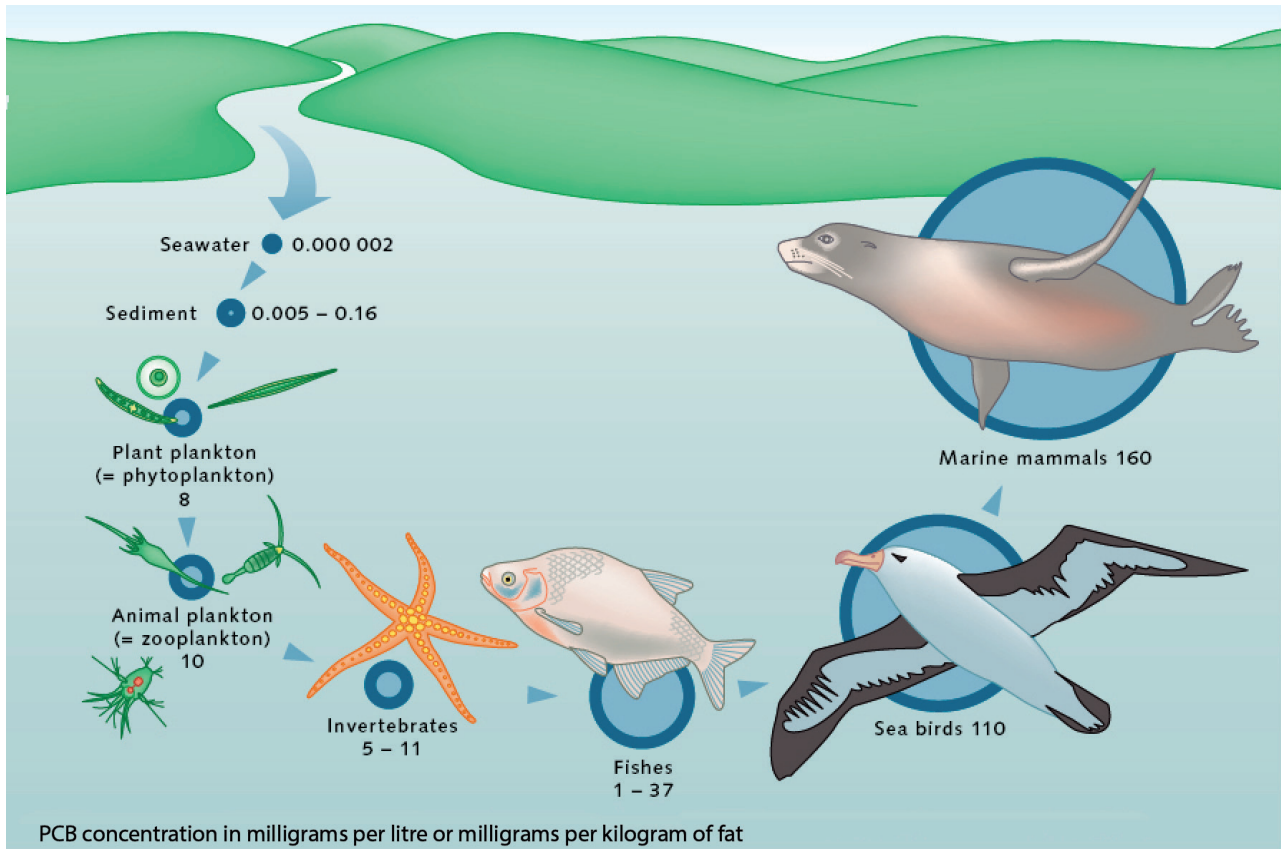
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer two questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[80 marks]**.



Section A

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

Figure 1: Levels of polychlorinated biphenyls (PCBs) in a marine ecosystem



[Source: © Walther-Maria Scheid / maribus gGmbH.]



1. (a) Identify the primary consumer in the food chain shown in **Figure 1**. [1]

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- (b) State **one** reason why PCB is biomagnified in food chains such as the one shown in **Figure 1**. [1]

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- (c) Calculate the percentage change in PCB content between sea birds and marine mammals. [1]

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- (d) Distinguish between biomagnification and bioaccumulation. [2]

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- (e) Suggest **two** disadvantages of using a pyramid to represent the biomass of organisms in the food chain shown in **Figure 1**. [2]

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(This question continues on page 5)



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Answers written on this page
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(Question 1 continued)

- (f) State **two** abiotic factors that can influence net primary productivity of the marine ecosystem in **Figure 1**.

[2]

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- (g) Outline the reasons for energy losses between trophic levels in the food chain shown in **Figure 1**.

[4]

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- (h) Suggest **two** difficulties of managing PCB pollution in marine ecosystems.

[2]

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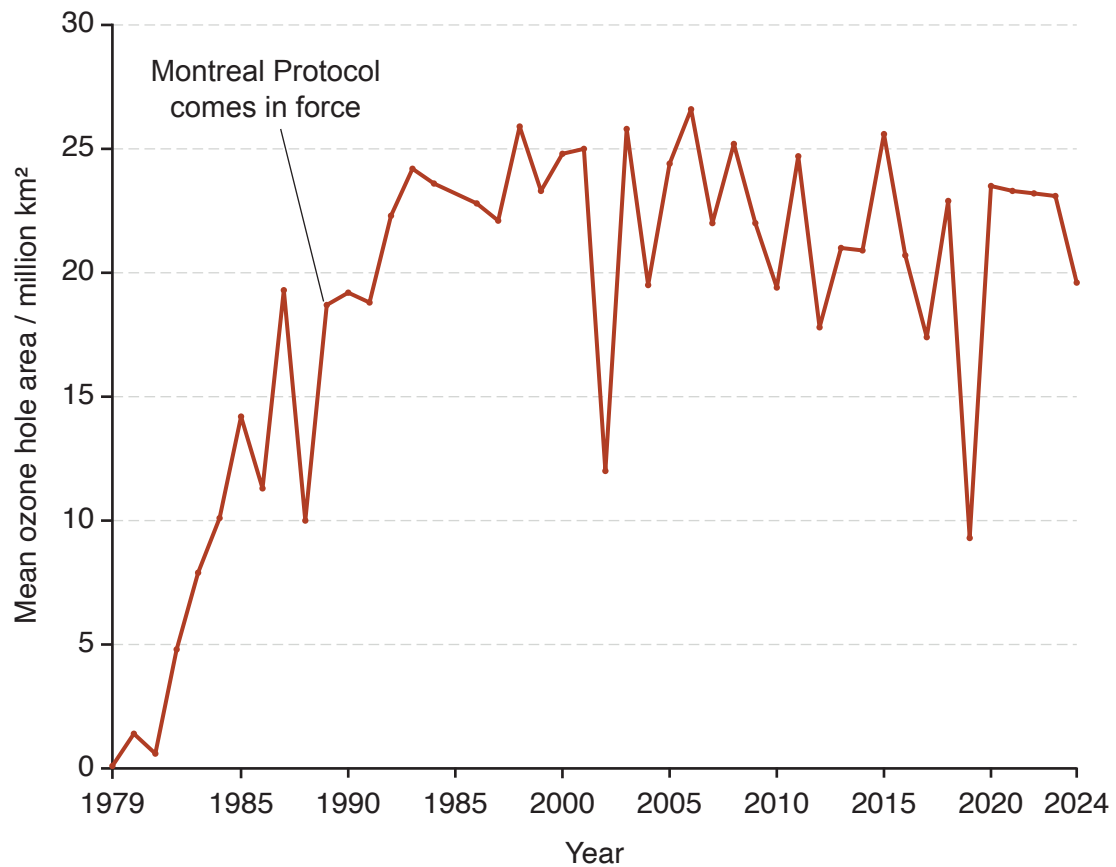
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Figure 2: Changes in the mean area of the ozone hole above the Antarctic over time



2. (a) Describe the changes in the mean area of the ozone hole over the Antarctic between 1979 and 2024, as shown in **Figure 2**.

[2]

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- (b) Identify the year in which the mean area of the Antarctic ozone hole was at its greatest.

[1]

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(This question continues on the following page)



(Question 2 continued)

- (c) The Montreal Protocol regulates the production, trade and use of chlorofluorocarbons (CFCs). Outline how CFCs affect the ozone hole.

[2]

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- (d) With reference to **Figure 2**, list **two** risks to human health which may have increased between 1979 and 2023.

[2]

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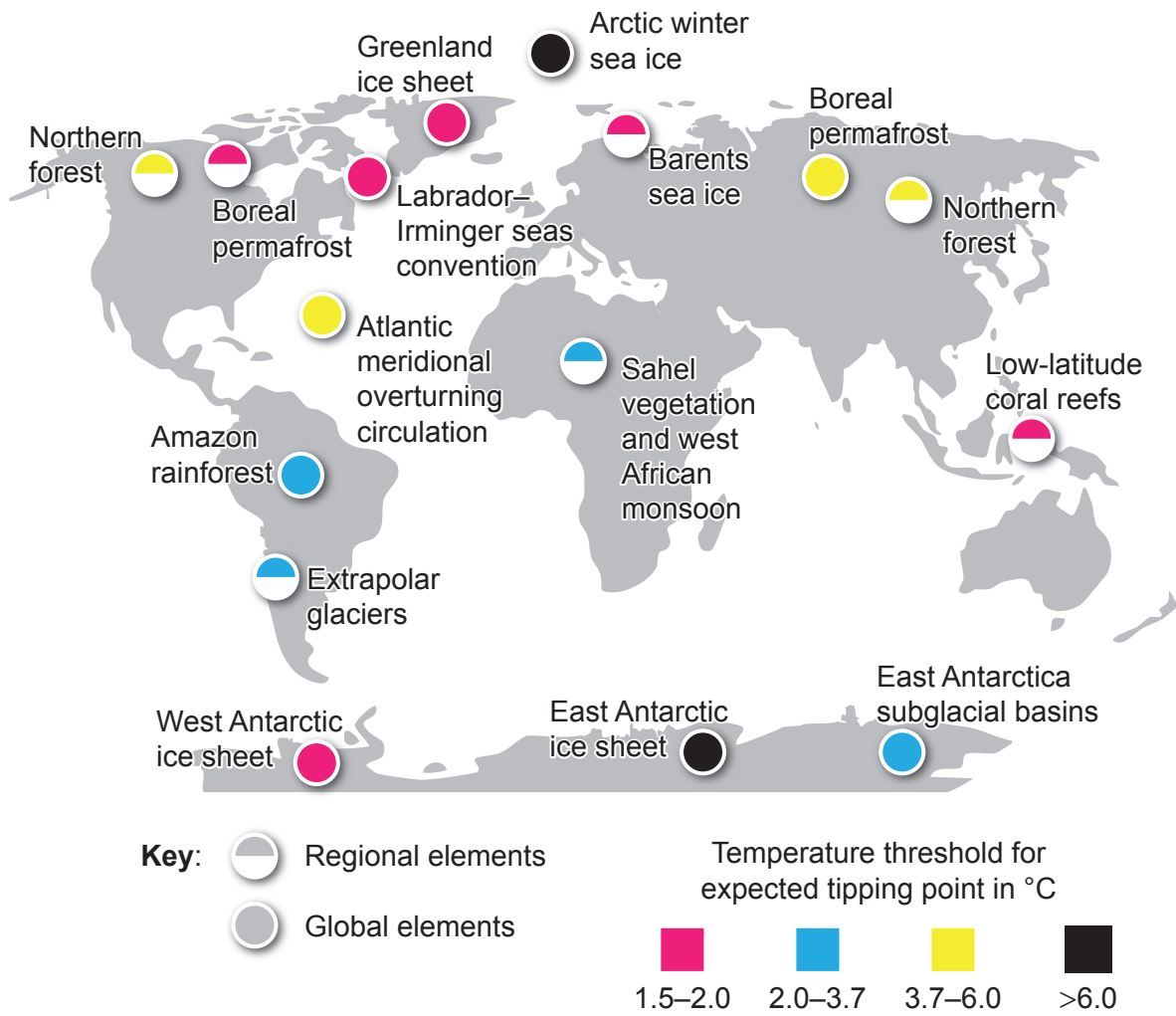
- (e) Discuss how efforts to promote the United Nations' Sustainable Development Goal 8 ("Decent work and economic growth") could contribute to the recovery of the ozone layer.

[4]

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Figure 3: The geographical distribution of global and regional climate tipping points



3. (a) With reference to **Figure 3**, identify **one** global element that is closest to reaching its tipping point.

[1]

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- (b) With reference to **Figure 3**, predict **two** environmental impacts of the Greenland ice sheet reaching its climate tipping point.

[2]

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- (c) Outline a positive feedback loop that could lead to Boreal permafrost collapse.

[2]

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- (d) Distinguish between anthropocentric and technocentric approaches that could prevent the elements shown in **Figure 3** from reaching their climate tipping points.

[3]

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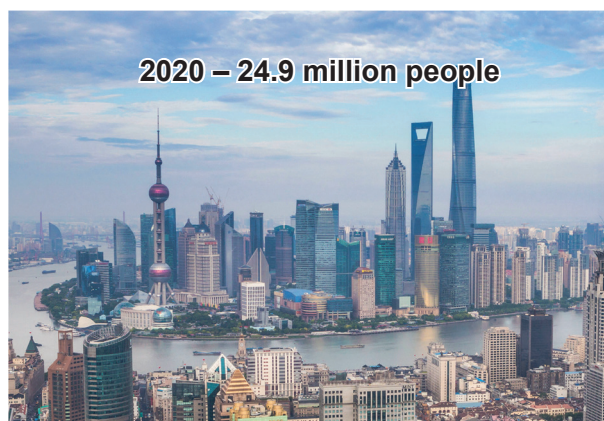


Figure 4(a): City of Shanghai, China, in 1990



[Source: Reuters.]

Figure 4(b): City of Shanghai, China, in 2020



[Source: mauritius images GmbH/Alamy Stock Photo.]

4. (a) Suggest **two** reasons for the change in population in Shanghai, as shown in **Figures 4(a) and 4(b)**. [2]

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- (b) Describe **two** ways in which urban development, such as that presented in **Figures 4(a) and 4(b)**, could affect the environment. [2]

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- (c) Outline **two** reasons why Shanghai, as shown in **Figure 4(b)**, is more prone to photochemical smog than smaller cities. [2]

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Section B

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

5. (a) With reference to **four** properties of water, describe how they support and sustain life. [4]
- (b) Explain the role of ocean currents in climate regulation and atmospheric composition. [7]
- (c) To what extent is legislation more effective than education in achieving water security? [9]
6. (a) Outline **four** different ways in which human activities impact the nitrogen cycle. [4]
- (b) Explain how the niche of a terrestrial predator could change due to the introduction of an invasive producer species. [7]
- (c) “The ecological footprint of a society following a plant-based diet is likely to be smaller than that of a society in which meat is eaten.” Discuss this statement. [9]
7. (a) Outline the relationships between the different levels of biodiversity. [4]
- (b) Explain how different methodologies can be used to analyse the impact of mining activity on plant biodiversity in a named ecosystem. [7]
- (c) To what extent is biodiversity loss driven by economic development? [9]



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References:

- Figure 1:** © Walther-Maria Scheid / maribus gGmbH.
- Figure 2:** NASA Ozone Watch (2025) – with minor processing by Our World in Data. “Maximum ozone hole area” [dataset]. NASA Ozone Watch, “Ozone hole area and concentration” [original data]. <https://ourworldindata.org/grapher/antarctic-ozone-hole-area>. Under CC BY 4.0 license <https://creativecommons.org/licenses/by/4.0/>. Source adapted.
- Figure 3:** Potsdam Institute for Climate Impact Research (PIK). <https://www.pik-potsdam.de/en/output/infodesk/tipping-elements>. Licensed under CC-BY 4.0 <https://creativecommons.org/licenses/by/4.0/deed.en>. Source adapted.
- Figure 4(a):** Reuters, 1987. *A general view of the Shanghai's financial district of Pudong* [image online] Available at: <https://www.reutersconnect.com/app/item/a-general-view-of-the-shanghais-financial-district-of-pudong/dGFnOnJldXRlcnMuY29tLDE5ODc6bmV3c21sX0dNMUU5OEMxRlFCMDE> [Accessed 2 July 2026]. Source adapted.
- Figure 4(b):** mauritius images GmbH / Alamy Stock Photo, 2015. *China, Shanghai City, The Bund and Pudong district skyline, Huangpu River*. [image online] Available at: https://www.alamy.com/china-shanghai-city-the-bund-and-pudong-district-skyline-huangpu-river-image151430877.html?_gl=1*11uuihb*_up*MQ..&gclid=Cj0KCQjwk_bPBhDXARIsACiq8R2AQnqkO8TpfnGXyYrMCedH2ToVIBz1t6cC9-918FMIYFHelJ0MZLwaAvgpEALw_wcB&gbraid=0AAAAACvNtr2yqloLshO0-rAFXWzDCitLN [Accessed 2 July 2026]. Source adapted.



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