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Environmental systems and societies
Standard level
Paper 2

6 May 2024

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

Candidate session number

2 hours

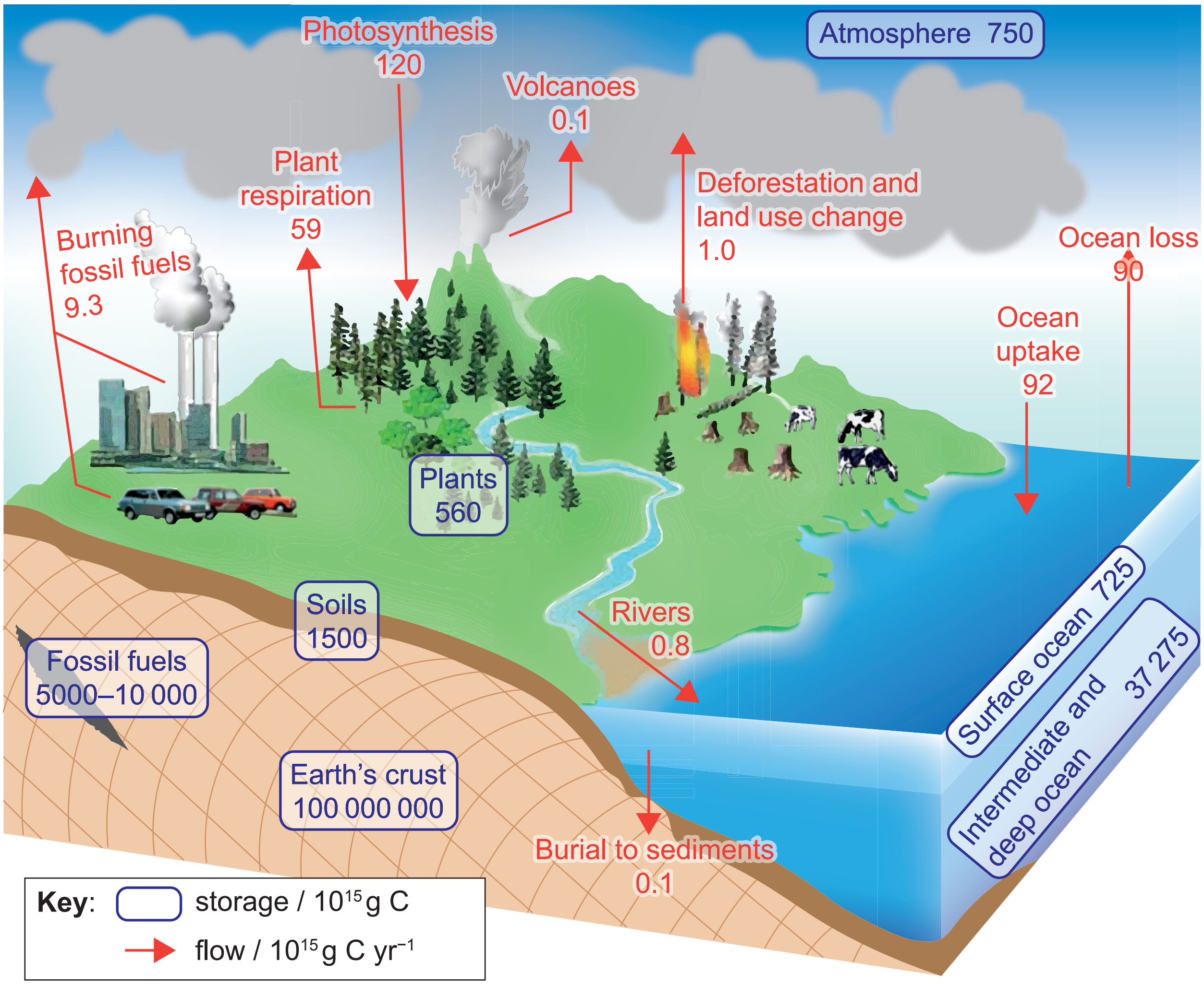
Instructions to candidates

- 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]**.

Section A

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

Figure 1: Carbon cycle



1. (a) Identify **one** carbon flow caused by human activities in **Figure 1**. [1]

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(This question continues on the following page)

(Question 1 continued)

(b) Draw a labelled diagram to illustrate the flows of carbon between plants and the atmosphere shown in **Figure 1**. [2]

(c) Using the data in **Figure 1**, calculate the net gain in carbon in the oceans in 10^{15} g. [1]

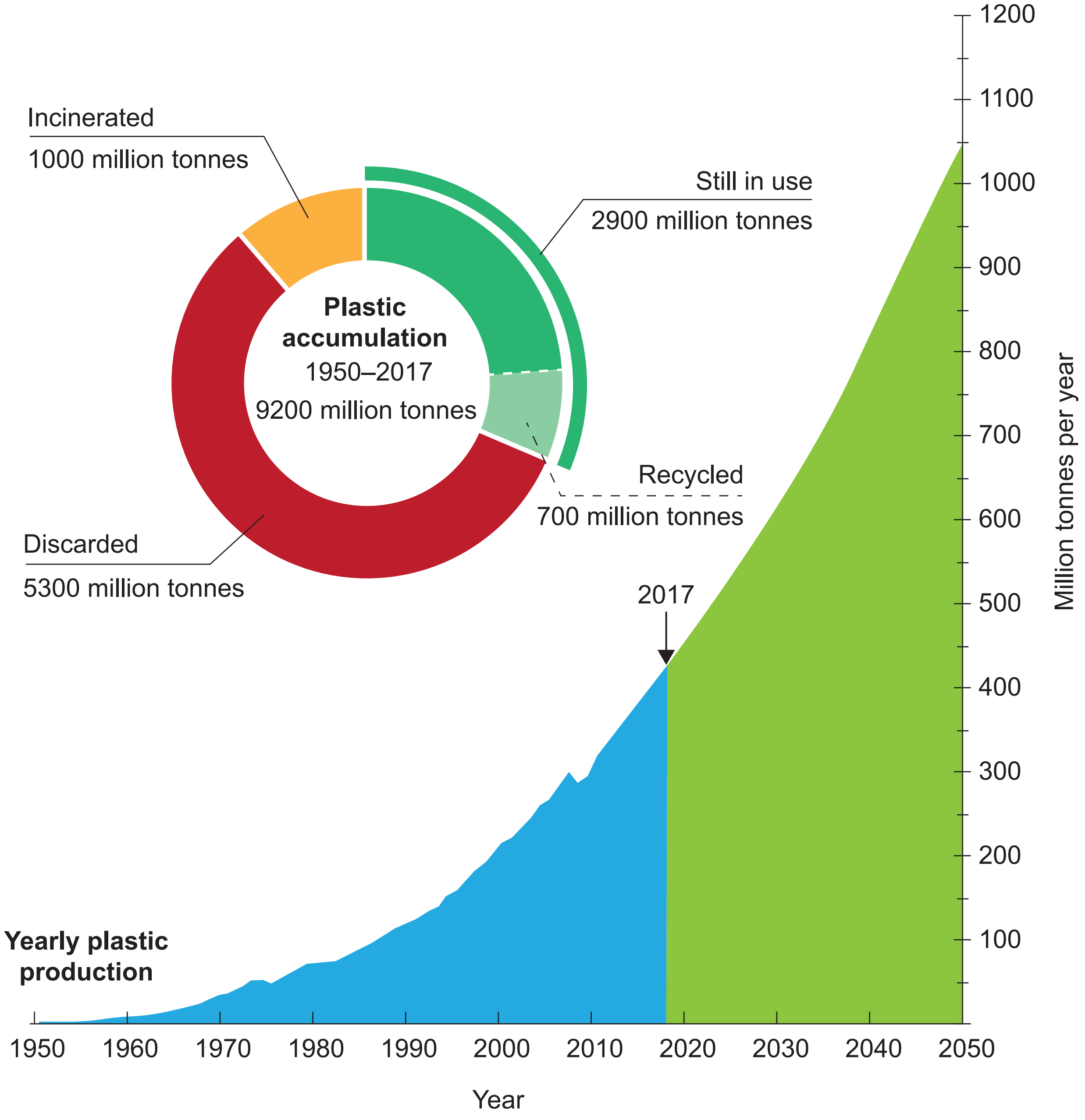
(d) Describe **one** advantage and **one** disadvantage of the oceans as a carbon sink. [2]

Advantage:

Disadvantage:

(e) Outline **one** method to mitigate the effects of atmospheric carbon storage. [1]

Figure 2: Global plastic production, accumulation and future trends



2. (a) Using **Figure 2**, estimate the mass of plastic that was produced in 2017. [1]

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(Question 2 continued)

(b) Calculate the percentage of accumulated plastic that was recycled between 1950 and 2017. [1]

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(c) Outline why the total accumulated plastic in 2017 is greater than the yearly production. [1]

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(d) Describe how the environmental impacts of discarded and incinerated plastic waste would differ. [2]

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(e) Describe **two** possible methods to reduce the future trends of plastic production shown in **Figure 2**. [2]

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(f) Explain **two** potential impacts of the future trends of plastic production on the global ecological footprint. [2]

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Figure 3(a): Average hourly variation in ozone on wet and dry days in Guarujá, Brazil

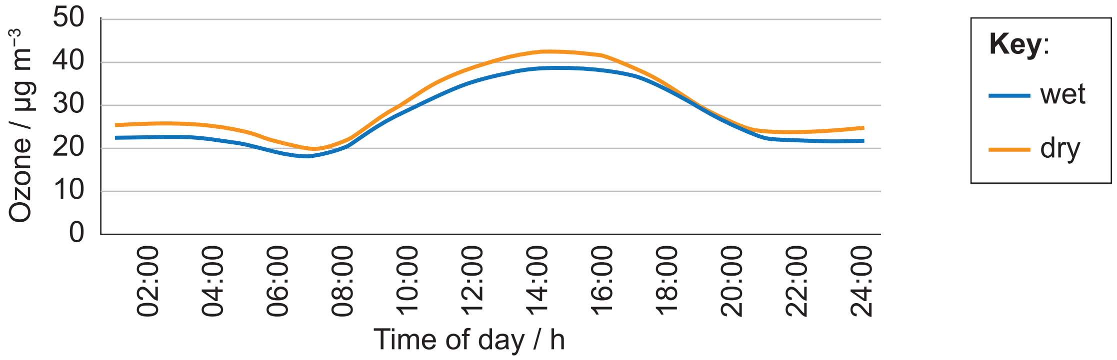


Figure 3(b): Average hourly variation in NO_x on wet and dry days in Guarujá, Brazil

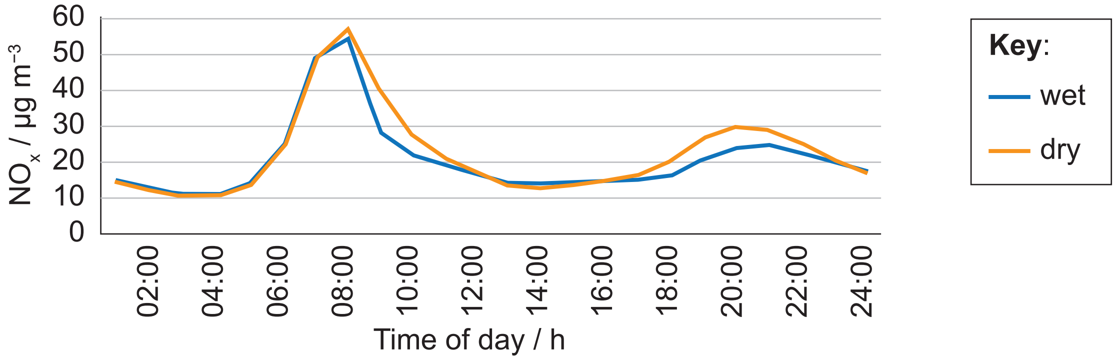
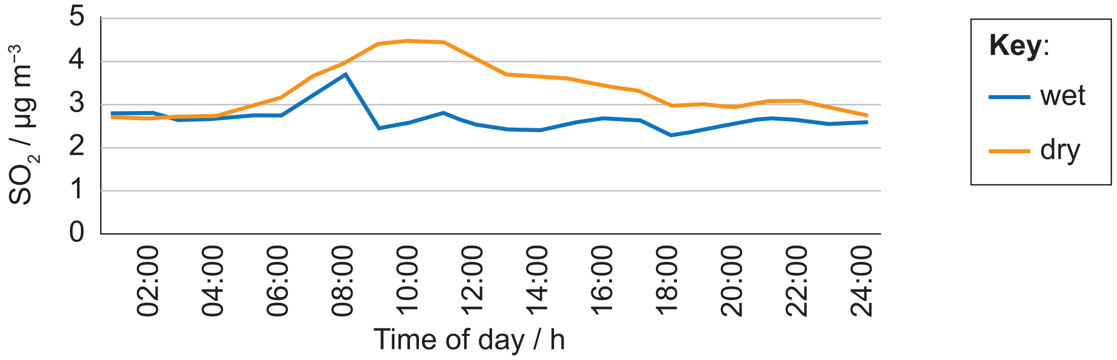


Figure 3(c): Average hourly variation in SO_2 on wet and dry days in Guarujá, Brazil



3. (a) Identify the time of day that ozone is at its lowest concentration on a wet day in **Figure 3(a)**. [1]

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(Question 3 continued)

(b) Outline **two** reasons for the trend of hourly ozone concentrations shown in **Figure 3(a)**. [2]

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(c) Describe **one** impact of high SO_2 concentrations on forest systems. [1]

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(d) Outline **one** possible source of the pollutant shown in **Figure 3(b)**. [1]

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(e) Outline why SO_2 levels are lower on wet days than on dry days, as shown in **Figure 3(c)**. [1]

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(f) Evaluate a strategy to manage the effects of **one** pollutant named in **Figure 3(b)** or **Figure 3(c)**. [3]

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Section B

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

4. (a) Outline the distinctive features of the anthropocentric environmental value system. [4]

(b) With reference to a named herbivore species, explain why its population growth curve follows an S-shape. [7]

(c) To what extent would an anthropocentric approach to addressing human population growth be the most successful in maintaining a sustainable population? [9]

5. (a) Outline the processes by which nitrogen in the atmosphere may eventually be found in the protein of a decomposer. [4]

(b) Explain why pyramids of numbers, biomass and productivity may vary in shape for different food chains. [7]

(c) To what extent can the practical strategies for obtaining data for a pyramid of numbers be made reliable? [9]

6. (a) Outline the mechanisms by which a terrestrial species may have evolved from an aquatic ancestor. [4]

(b) Explain the ways in which species diversity and an abundance of plant and herbivore species will increase the resilience of an ecosystem. [7]

(c) Evaluate management strategies for reducing the impact of agricultural pollution on an aquatic ecosystem. [9]

7. (a) Outline **two** input processes and **two** output processes that occur to and from the soil system. [4]

(b) Explain how negative and positive feedback mechanisms play a role in the process of global warming. [7]

(c) To what extent are the concepts of natural capital and natural income helpful in managing the sustainable use of natural resources? [9]

References:

Figure 1	The Globe Program, 2017. *Global Carbon Cycle Model*. [image online] Available at: https://www.globe.gov/do-globe/measurement-campaigns/past-projects/earth-as-a-system-projects/carbon-cycle [Accessed 13 December 2022]. Source adapted.
Figure 2	United Nations Environment Programme (2021). *From Pollution to Solution: A global assessment of marine litter and plastic pollution*. Nairobi. Page 17, Figure i: Global plastic production, accumulation and future trends.