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Environmental systems and societies
Standard level
Paper 2

29 October 2024

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

Figure 1(a): Municipal solid domestic waste (MSW) produced versus income level

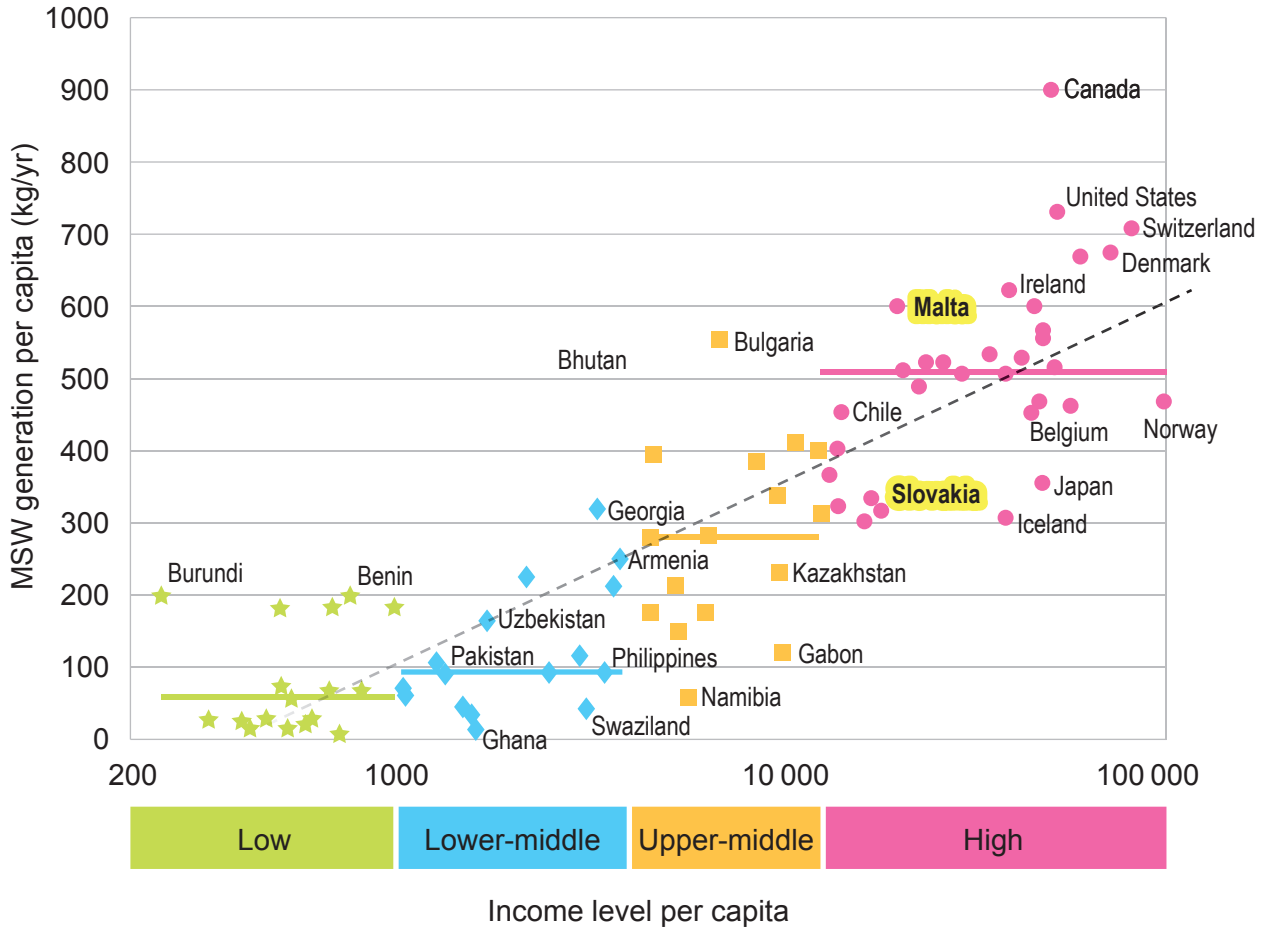
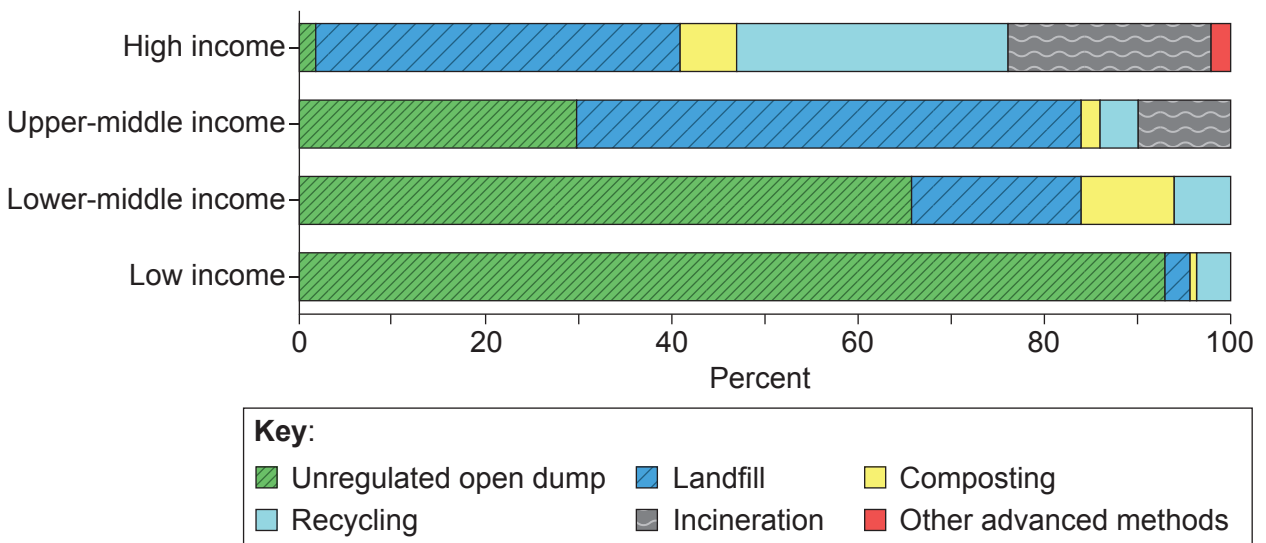


Figure 1(b): Waste disposal methods by per capita income



1. (a) Using **Figure 1(a)**, identify the amount of municipal solid domestic waste generated per capita in Malta. [1]

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- (b) Suggest **two** reasons why the amount of municipal solid domestic waste generated per capita differs between Slovakia and Malta. [2]

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- (c) (i) Describe the trend shown in the use of incineration as income level increases in **Figure 1(b)**. [1]

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- (ii) Suggest **two** reasons for the trend shown in the use of incineration as income level increases in **Figure 1(b)**. [2]

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- (d) Evaluate the use of recycling as a solid domestic waste strategy. [3]

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Figure 2(a): Diagram showing the expanse of the Mississippi River basin draining into the Gulf of Mexico

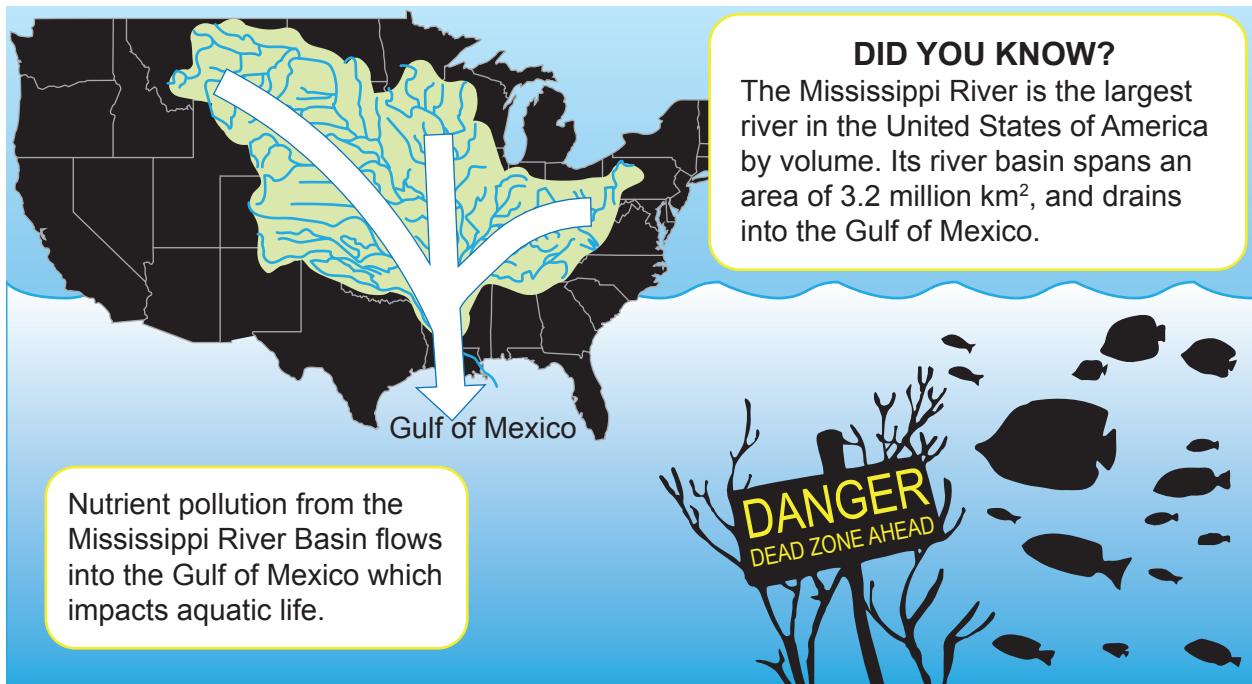
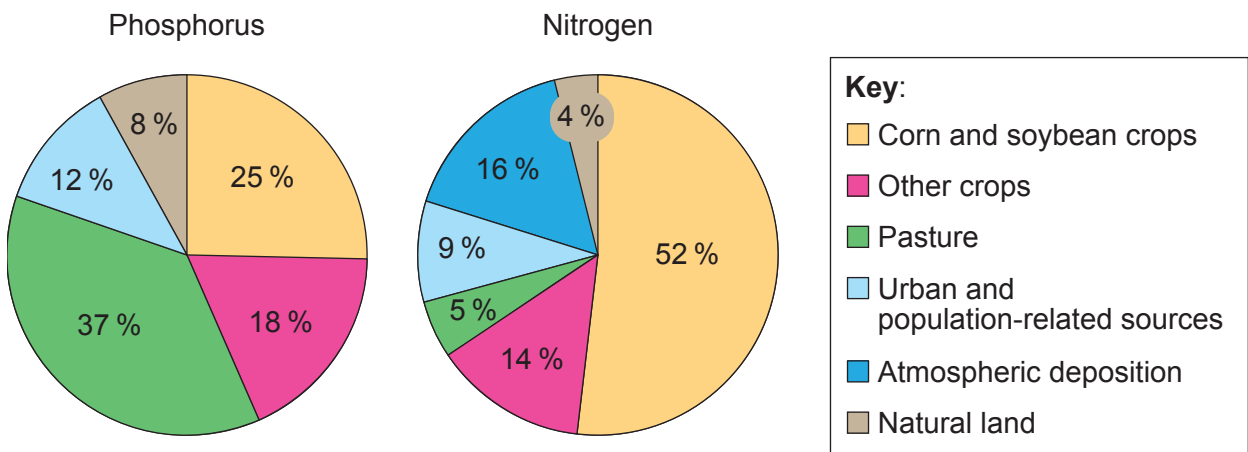


Figure 2(b): Pie charts showing sources of nutrients delivered to the Gulf of Mexico from the Mississippi River



2. (a) Using **Figure 2(b)**, state the source that has the highest contribution of nitrogen delivered to the Gulf of Mexico.

[1]

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(b) Using **Figures 2(a)** and **2(b)**, outline **two** reasons why nutrient pollution in the Gulf of Mexico is difficult to manage.

[2]

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(c) Explain how nutrient pollution could impact aquatic food production in the Gulf of Mexico. [4]

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(d) Outline **two** management strategies that could be used to reduce the production of nutrient pollution.

[2]

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Figure 3(a): A simplified food web in a kelp forest ecosystem

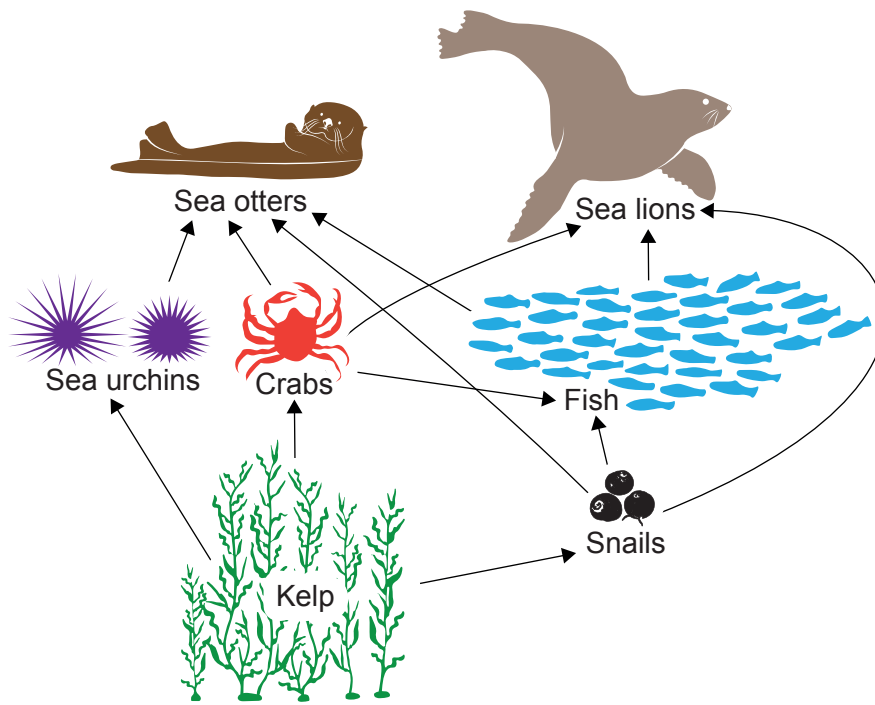
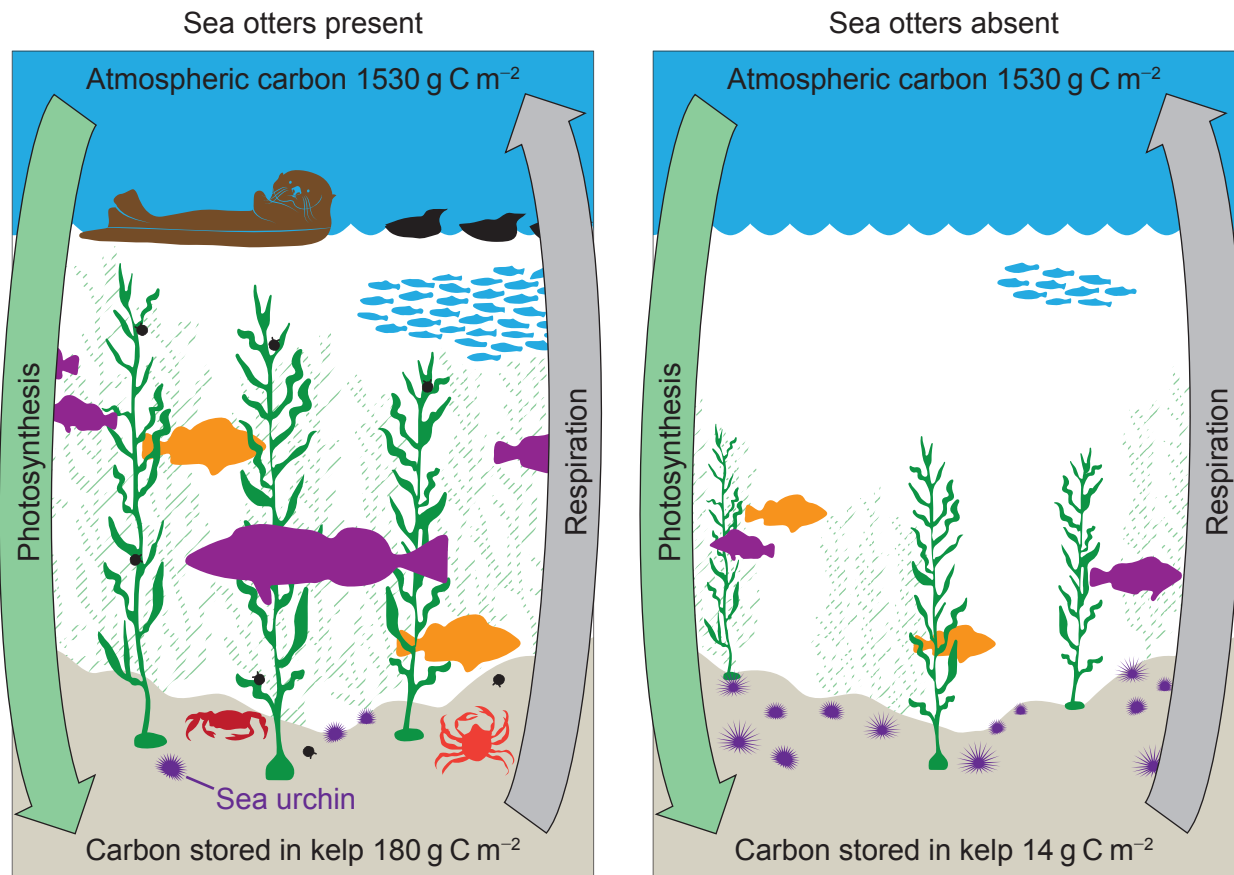


Figure 3(b): Kelp forest ecosystems with and without the presence of sea otters



The arrows indicate the flow of carbon between the atmosphere and the carbon stored in kelp.



3. (a) Calculate the difference between carbon stored in kelp in the ecosystem with and without sea otters. [1]

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- (b) State the trophic level of sea urchins in the kelp forest ecosystem shown in **Figure 3(a)**. [1]

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- (c) Explain how a reduction in sea otter numbers may impact the biodiversity of the kelp forest ecosystem. [3]

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- (d) Outline how the protection of sea otters could help mitigate climate change. [2]

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Section B

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

4. (a) Outline **two** inputs and **two** outputs of matter in soil systems. [4]
- (b) Explain how anthropocentric and technocentric value systems influence how soil resources are managed. [7]
- (c) To what extent are human food production systems more greatly influenced by cultural factors than they are by political, environmental or economic factors? [9]
5. (a) Outline **four** reasons why the carrying capacity of human populations can vary between countries. [4]
- (b) Evaluate the effectiveness of environmental impact assessments (EIAs) in promoting sustainable development. [7]
- (c) Human population growth always results in a loss of biodiversity.
Discuss the validity of this statement. [9]
6. (a) Outline the role of water in regulating global average temperature. [4]
- (b) Explain how urban air pollution could lead to significant economic losses. [7]
- (c) The *Montreal Protocol on Substances that Deplete the Ozone Layer* (1987) is one of the most successful international agreements on a major environmental issue.
Discuss the validity of this statement. [9]
7. (a) Outline **four** impacts of climate change on wild fisheries. [4]
- (b) Explain how sea level change could impact marine biodiversity. [7]
- (c) To what extent could the changing value of freshwater resources lead to conflict between different societies? [9]



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References:

Figure 1(a) United Nations Environment Programme (2015). *Global Waste Management Outlook*. Nairobi.

Figure 1(b) Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Urban Development. © Washington, DC: World Bank. <http://hdl.handle.net/10986/30317>. Licensed under Creative Commons BY 3.0 IGO. <https://creativecommons.org/licenses/by/3.0/igo/>. Source adapted.

Figure 2(b) U.S. Geological Survey, Department of the Interior/USGS.

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