

Structured Questions

Stability & Change

Stability in Ecosystems / Ecosystem Stability: Skills / Keystone Species / Sustainability in Ecosystems & Agriculture / Eutrophication / The Effects of Pollution / Restoring Ecosystems / Ecological Succession (HL) / Human Influence on Succession (HL)

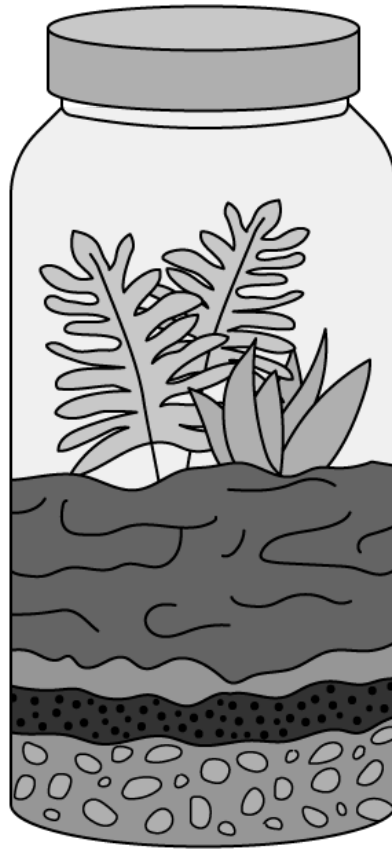
Easy (1 question)	/6
Medium (4 questions)	/40
Hard (2 questions)	/15
Total Marks	/61

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Easy Questions

- 1 (a) Abiotic factors can be controlled in order to study the response of a naturally occurring ecosystem using the set up below.



What is the name given to the set up shown in the image which allows the study of ecosystems?

(1 mark)

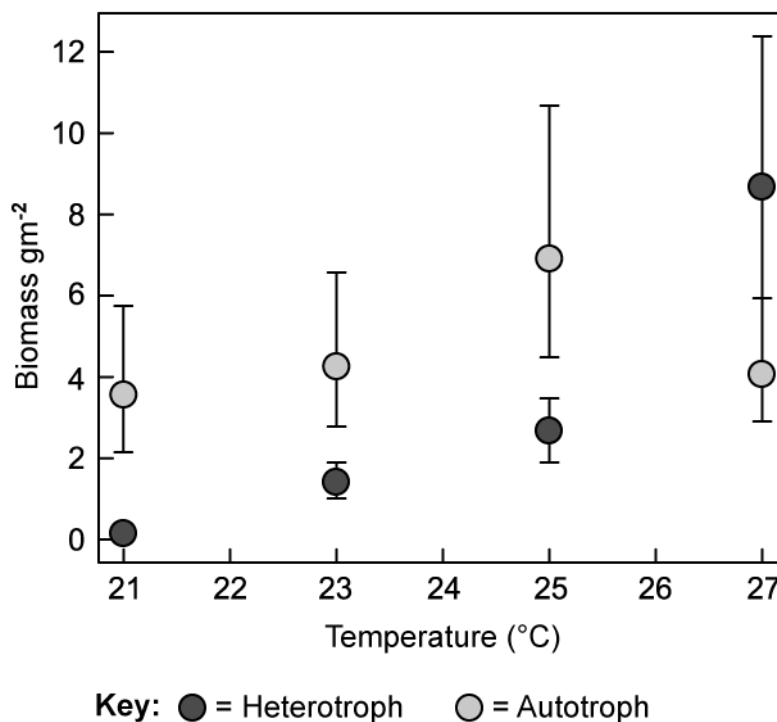
- (b) Suggest why the experiment set up in part **b**) should include the following features:

- A transparent container
 - A lid to seal the container
 - Minimal primary consumers and no secondary consumers
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(3 marks)

- (c) A mesocosm was set up to study the effect of increasing global temperatures on the biomass of aquatic autotrophs and heterotrophs.

The graph shows the data collected.



Describe what happened to the biomass of heterotrophs and autotrophs as temperatures increased from 21 °C to 27 °C.

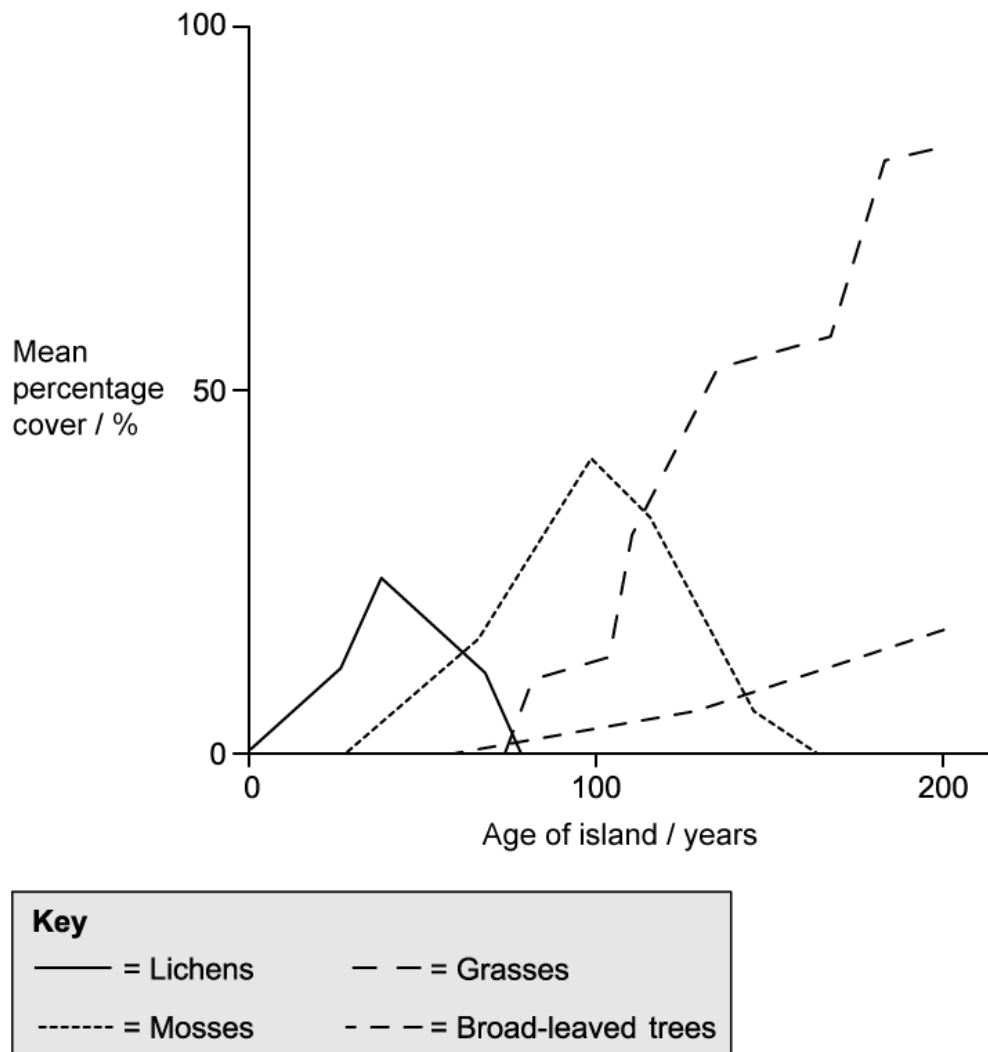
(2 marks)

Medium Questions

- 1 Evaluate the benefit of mesocosm experiments in understanding interactions between organisms in their natural environment.

(3 marks)

2 (a) A small island off the coast of Iceland formed around 200 years ago. The graph shows data collected from historical records and more recent scientific research, estimating the percentage cover of different plant species since the island was formed.



The island is small, with a surface area of about 100 square metres. Describe how the group of biologists could determine the present-day mean percentage cover of grass on the island.

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(4 marks)

- (b) The biologists hypothesised that the results shown in the graph in part (a) were due to succession taking place on the island.

Explain why the biologists think this. Use the graph in part (a) to support your answer.

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(4 marks)

- (c) If the biologists just wanted to study the abundance of broad-leaved trees on the island in part (a), they could have used frequency rather than percentage cover.

Suggest why this would be possible.

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(1 mark)

- (d) The biologists in part (a) are trying to decide if the grasses and broad-leaved trees that are currently present on the island represent the climax community.

State **two** features of a climax community.

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(2 marks)

- (e) With reference to the island ecosystem, describe what may be observed if cyclical succession were to take place.

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(3 marks)

- 3 (a)** Hinewai Reserve is a private nature reserve in the South Island of New Zealand. The reserve is part of an ecological restoration project with a focus on regenerating natural forests through natural succession.

Describe how projects such as the Hinewai Reserve help to restore biodiversity.

(3 marks)

- (b)** Ecologists chose Hinewai as a suitable environment for the restoration project as it was already dominated by an evergreen gorse shrub, *Ulex europaeus*. Gorse was used as a nursery species initially to help with the establishment of newly introduced native seedlings, until they could outcompete it.

Suggest what benefit was provided by *U. europaeus* in the initial stages of the restoration process.

(2 marks)

- (c)** Hinewai Reserve is an example of secondary succession, which means that progression to a climax community occurs more quickly.

Explain why succession in the Hinewai reserve is likely to occur more quickly than in examples of primary succession.

(3 marks)

4 (a) *One mark is available for clarity of communication throughout this question.*

Identify **three** key features of a stable ecosystem.

(3 marks)

(b) Outline the impacts of deforestation on the stability of the Amazon rainforest.

(8 marks)

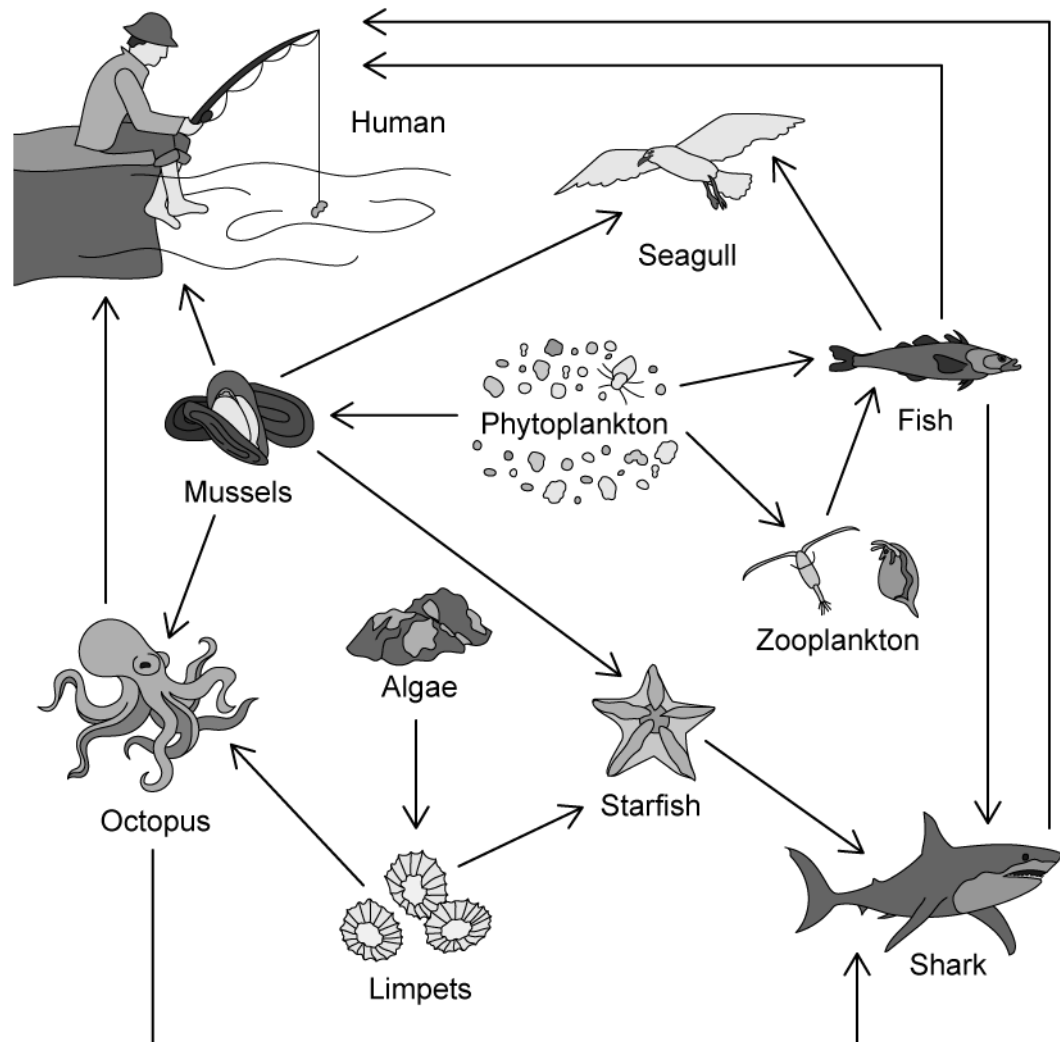
(c) Mercury is a toxin that builds up in ecosystems through biomagnification, causing mitochondrial dysfunction in cells.

Explain the consequences of this toxin on the function of the nervous system of mammals.

(4 marks)

Hard Questions

1 (a) A basic food web for a large marine ecosystem can be seen below.



Nutrient-rich sewage from coastal settlements results in rapid growth of algae (algal blooms), which leads to a reduction in light intensity on the ocean floor.

Suggest the general effects this may have on a community in a marine ecosystem.

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(4 marks)

- (b)** Since 2013, numbers of starfish in the large marine ecosystems have been seen to dramatically reduce by up to 80% in some regions.

Starfish act as detritivores in the marine ecosystems, feeding on dead and decaying organic matter, as well as preying on organisms such as mussels and limpets.

Some scientists have suggested that a decline in starfish numbers may have a positive impact on the marine ecosystem.

Evaluate this statement.

(4 marks)

2 (a) *One mark is available for clarity of communication in this question.*

Outline how scientists may simulate a naturally occurring ecosystem to establish how the sustainability of that ecosystem may be influenced by global warming.

(4 marks)

(b) Explain the use of the chi-squared test to analyse data collected from the simulated ecosystem.

(3 marks)