



Biology
Standard and Higher level
D4.2 Stability and change Paper 1A

11 May 2026

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

1 hour [Paper 1A]

Instructions to candidates

- Answer all questions.
- For each question, choose the answer you consider to be the best.
- A calculator is required for this paper.
- This paper generally presents questions in the same order the concepts are presented in the syllabus guide. The earlier questions are usually but not always easier than the later questions. Although most questions focus on this topic only, some are linked to other topics.
- This paper contains challenging IB-style problems. It is meant to enrich your learning and improve your mastery of the concepts presented in this topic after you have studied it.
- All of the questions here are original and written by me.
- **None of the questions are from past papers.**
- The maximum mark for paper 1A is **[40 marks]**.

1. What makes an ecosystem stable?
 - A. The self-sustaining organisms within it
 - B. The self-sustaining processes within it
 - C. The self-sustaining nutrients within it
 - D. The self-sustaining food webs within it

2. Why is nutrient recycling a requirement for ecosystem stability?
 - A. Energy is lost at each trophic level
 - B. Matter is lost at each trophic level
 - C. Earth is an open system
 - D. Earth is a closed system

3. Why is genetic diversity a requirement for ecosystem stability?
 - A. Biodiversity enables ecosystems to exist for millions of years
 - B. Ecosystems cannot exist without genetic diversity to drive evolution
 - C. Communities with low diversity become vulnerable to disturbances
 - D. Natural selection keeps ecosystems stable and requires variation

4. What is a consequence of climate change on ecosystem stability?
 - A. Climatic variables will change with time due to human influence
 - B. Stability depends on climate variables remaining the same
 - C. Mismatch between organism tolerance levels and climatic variables makes ecosystems less stable
 - D. Biodiversity will increase as more stable ecosystems take over

5. What is an ecological tipping point?
 - A. Reversible and fast changes to an ecosystem state due to a disturbance
 - B. Reversible and fast changes to an ecosystem state after passing a threshold
 - C. Irreversible and fast changes to an ecosystem state due to a disturbance
 - D. Irreversible and fast changes to an ecosystem state after a passing a threshold

6. Which of the following is an example of an ecological tipping point?
 - A. Predator populations decline after a rapid period of growth
 - B. Rapid loss of rainforest after continuous logging
 - C. Migration of a bird population during a harsh winter season
 - D. Rapid exponential growth of an animal population

7. Why are preservation efforts important even if the tipping point is unknown?
 - A. The tipping point may be passed before it is known
 - B. The tipping point may be reversed before it is known
 - C. Preservation is an ethical responsibility
 - D. Preservation will cost more if more damage occurs

8. Why are closed mesocosms preferable over open ones?
 - A. They are easier to control
 - B. They are easier to maintain in a laboratory
 - C. They are more preferable for aquatic and microbial mesocosms
 - D. They are more cost effective

9. Why are aquatic mesocosms likely to be more successful than terrestrial ones?
 - A. Aquatic food webs are inverted and easier to study
 - B. Water composition is easier to control than air composition
 - C. Terrestrial animals can suffocate in closed mesocosms
 - D. Nutrient cycling in water is faster

- 10.** Why are microbial mesocosms likely to be more successful than terrestrial ones?
- A. Microbes are easier to study under a light microscope
 - B. Microbes are cost effective to culture and maintain
 - C. Microbes involve more ethical responsibility
 - D. Microbes allow the investigation of more independent variables
- 11.** What is a consequence of removing keystone species?
- A. Loss of only organisms directly interacting with the keystone species
 - B. Replacement of the keystone species with another
 - C. Establishment of new trophic levels to compensate
 - D. Trophic cascades that destabilize the ecosystem
- 12.** What is eutrophication?
- A. High decomposition rates due to rapid algal death
 - B. Low biochemical oxygen demand due to high algal growth rates
 - C. Ecosystem death due to high biochemical oxygen demand
 - D. Algal blooming followed by algal death due to nutrient leaching
- 13.** Why is biochemical oxygen demand (BOD) a good measure of eutrophication?
- A. It measures the direct effects of nutrient leaching on decomposition rates
 - B. It measures the amount of oxygen used by decomposers
 - C. It measures oxygen levels by algae due to photosynthesis
 - D. It measures the demand of oxygen by dying fish populations
- 14.** What causes biochemical oxygen demand (BOD) to increase during eutrophication?
- A. Algal blooming
 - B. Decreased light intensity
 - C. Heterotroph death
 - D. Decomposition

15. What is the difference between bioaccumulation and biomagnification?
- A. Only bioaccumulation focuses on toxin levels in an individual organism
 - B. Only biomagnification focuses on toxin levels in an individual organism
 - C. Only bioaccumulation focuses on toxin levels in an individual trophic level
 - D. Only biomagnification focuses on toxin levels in an individual trophic level
16. How can leaching of nutrients like nitrogen and phosphorus destabilize ecosystems?
- A. It can lead to rapid exponential growth of primary and secondary consumers
 - B. It can lead to rapid exponential growth of tertiary consumers
 - C. It can lead to rapid exponential growth of primary producers
 - D. It can lead to rapid exponential growth of heterotrophs
17. How are predatory birds like the Eurasian kestrel (*Falco tinnuncius*) affected by DDT sprayed on crop plants?
- A. DDT bioaccumulates in crop plants and reduces primary production
 - B. DDT bioaccumulates in the tissues of primary consumers only
 - C. DDT biomagnifies across a food chain with the lowest levels in predatory birds
 - D. DDT biomagnifies across a food chain with the highest levels in predatory birds
18. In what chemical compound does mercury bioaccumulate in?
- A. Dimethyl mercury
 - B. Methylene mercury
 - C. Methyl mercury
 - D. Methoxy mercury
19. What is the maximum sustainable yield?
- A. The harvest amount required for maximal replacement rate
 - B. The harvest amount required for maximal economic benefit
 - C. The yield required for populations to regrow sustainably after harvest
 - D. The yield required for populations to achieve sustainable population levels

- 20.** What fraction of the population should be harvested for maximum sustainability?
- A. 1.0 K
 - B. 0.75 K
 - C. 0.5 K
 - D. 0.25 K
- 21.** Why do top consumers have the highest concentrations of a toxin?
- A. They are at the top of the food chain so they receive concentrated energy
 - B. They consume prey that have already accumulated toxins
 - C. They have slower metabolism which facilitates bioaccumulation
 - D. They have more fat tissue capable of bioaccumulation than lower consumers
- 22.** What chemical property of a substance would increase its ability to bioaccumulate?
- A. Lipophobic
 - B. Hydrophilic
 - C. Hydrophobic
 - D. Amphipathic
- 23.** Which process must occur faster than the other for bioaccumulation to occur?
- A. Assimilation > Metabolism
 - B. Assimilation > Elimination
 - C. Absorption > Assimilation
 - D. Absorption > Elimination

24. What is the difference between microplastic and macroplastic pollution?

	Microplastic pollution	Macroplastic pollution
A.	Plastic pollution of local water bodies	Plastic pollution of global water bodies
B.	Pollution by small plastic debris	Pollution by large plastic debris
C.	Plastic pollution of small organisms	Plastic pollution of large organisms
D.	Plastic pollution of small ecosystems	Plastic pollution of large ecosystems

25. What is the role of scientists in influencing public perception of ecological issues?

- A. Clear communication of scientific findings
- B. Conducting research around current ecological issues
- C. Lobbying politicians to fund more conservation efforts
- D. Addressing modern ecological issues like climate change

26. The image shows the Hinewai Reserve in New Zealand.



Which of the following is a rewilding method that has been used to restore natural processes in the Hinewai Reserve?

- A. Ex situ conservation
- B. Reducing human influence
- C. Reclamation of farmland
- D. Controlled dam management

- 27.** What size of plastic debris would be considered macroplastic?
- A. 5nm
 - B. 5cm
 - C. 5 μ m
 - D. 5pm
- 28.** Why is reestablishment of habitat connectivity important in rewilding?
- A. It helps create new food webs and interactions between species
 - B. It reduces disconnection within the ecosystem
 - C. It promotes human intervention to reestablish natural processes
 - D. It helps organisms evolve by providing open niches within habitats
- 29. [AHL]** What is ecological succession?
- A. The ability of an ecosystem to change with time
 - B. The change in the structure of a population with time
 - C. The change in the structure of a community with time
 - D. The change in the structure of biotic and abiotic factors with time
- 30. [AHL]** What can trigger succession?
- I. Abiotic factors
 - II. Biotic factors
 - III. Soil quality
- A. I only
 - B. II only
 - C. II and III only
 - D. I and II only

31. **[AHL]** What is the role of pioneer species in primary succession?
- A. They introduce genetic diversity to the ecological community
 - B. They create favorable soil conditions for the growth of larger plants
 - C. They symbiotic relations with decomposers to grow the food web
 - D. They allow climax communities to remain stable
32. **[AHL]** What enables the establishment of complex food webs during primary succession?
- A. The gradual increase in primary production
 - B. The gradual increase in the number of species
 - C. The gradual increase in the amount of soil erosion
 - D. The gradual increase in climax communities
33. **[AHL]** What is the difference between primary and secondary succession?
- A. The kind of biotic factors present before succession
 - B. The amount of biotic factors present before succession
 - C. The kind of abiotic factors present before succession
 - D. The amount of abiotic factors present before succession
34. **[AHL]** What is cyclical succession?
- A. Different communities are repeated at regular intervals
 - B. Different climax communities are repeated at regular intervals
 - C. Different environmental conditions are repeated at regular intervals
 - D. Different kinds of pollution lead to multiple climax communities
35. **[AHL]** How is cyclical succession different from secondary succession?
- A. It returns to the original community after disturbances
 - B. It requires predator and prey cycles in its community structure
 - C. It does not tend towards the establishment of a climax community
 - D. It relies on the establishment of nutrient cycling before pioneer species

36. [AHL] Which of the following can cause arrested succession?

- I. Drainage of wetlands
 - II. Production of agrochemicals
 - III. Grazing of livestock
- A. I only
 - B. II only
 - C. II and III only
 - D. I and III only

37. [AHL] What is a consequence of arrested succession?

- A. Regression to colonization of pioneer species
- B. A climax community is not established
- C. Another kind of succession dominates
- D. Succession becomes cyclical until the disturbance is removed

38. [AHL] What is the difference between keystone and pioneer species?

- A. Keystone species are more abundant
- B. Pioneer species are more abundant
- C. Keystone species establish the conditions necessary for ecosystem stability
- D. Pioneers species establish the conditions necessary for ecosystem stability

39. [AHL] What is a consequence of primary succession?

- A. Increase in plant size
- B. Decrease in plant size
- C. Increase in natural disasters
- D. Decrease in natural disasters

40. **[AHL]** Does cyclical succession lead to ecosystem instability?
- A. No because climatic variables can still remain within tolerance levels
 - B. No because ecosystems can be stable but changing
 - C. Yes because ecosystems cannot achieve stability while undergoing change
 - D. Yes because nutrient cycling will be disrupted as food webs are established
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References:

Hinewai Reserve Image from 二师兄, January 2017. https://www.tripadvisor.com/Attraction_Review-g285727-d1989176-Reviews-Hinewai_Reserve-Akaroa_Canterbury_Region_South_Island.html

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