

APOLLO

Populations and communities

SL

Biology

First assessment 2025

12 questions | questions

24. What is an abiotic factor in an ecosystem?

- A. The mutualistic relationship between zooxanthellae and coral
- B. The predator–prey relationship between wolves and elk
- C. The salinity surrounding marram grass on a sand dune
- D. An infectious disease affecting a population of rabbits

26. A capture–mark–release–recapture experiment was used, together with the Lincoln index formula (population size estimate = $M \times N/R$), to estimate the population size of common periwinkles (*Littorina littorea*) on a rocky shore. The table shows the data collected.

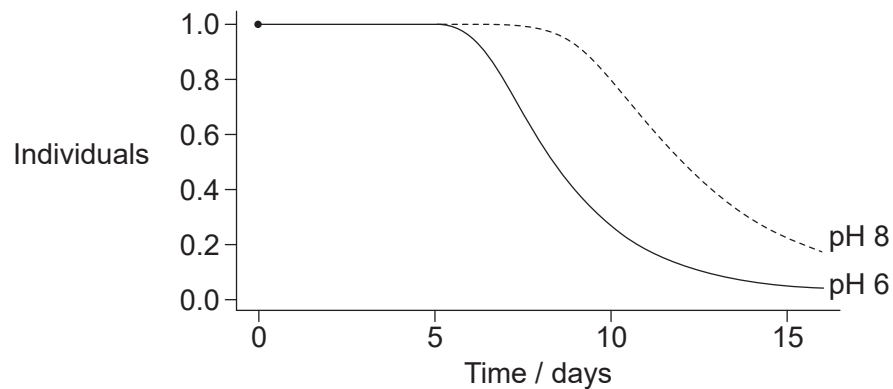


Individuals captured and marked initially	100
Individuals recaptured	50
Marked individuals recaptured	10

What is the estimated size of the population?

- A. 160
- B. 500
- C. 1000
- D. 5000

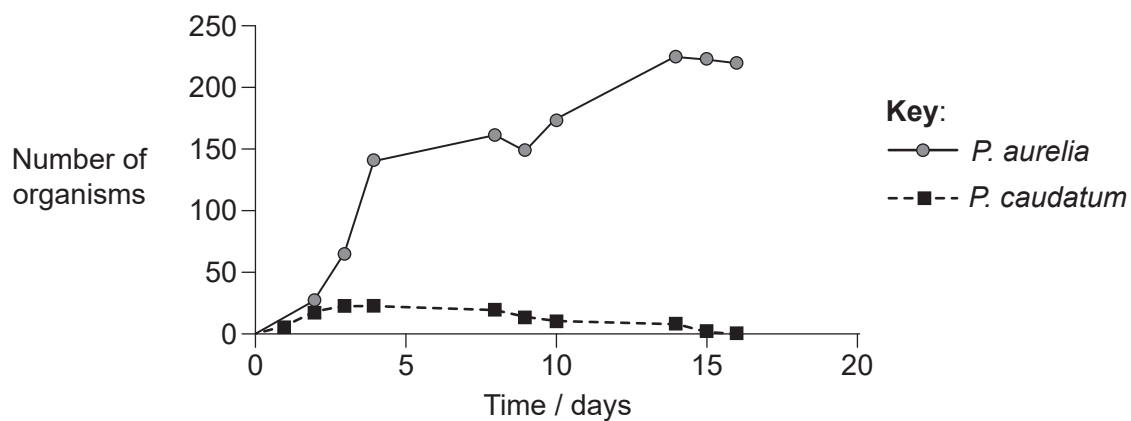
25. The life cycle of the mosquito (*Aedes aegypti*) starts as a larva, then moves to the pupa stage, after which it moves to the adult stage. The influence of pH on mosquito larval development was measured. On the graph, 1.0 indicates that all individuals are at the larval stage and 0 indicates that all are pupae.



What can be concluded about the effect of pH on larval development from this graph?

- A. All mosquito larvae developed into pupae by day 15 at both pH values.
- B. pH has no effect on larval development of the mosquito.
- C. On day 10, there are more pupae at pH 8 than at pH 6.
- D. Mosquito larvae developed faster at pH 6.

27. *Paramecium aurelia* and *Paramecium caudatum* are two species of paramecium that grow well individually. Scientists grew these two species of paramecium together, and the result is shown in the graph.



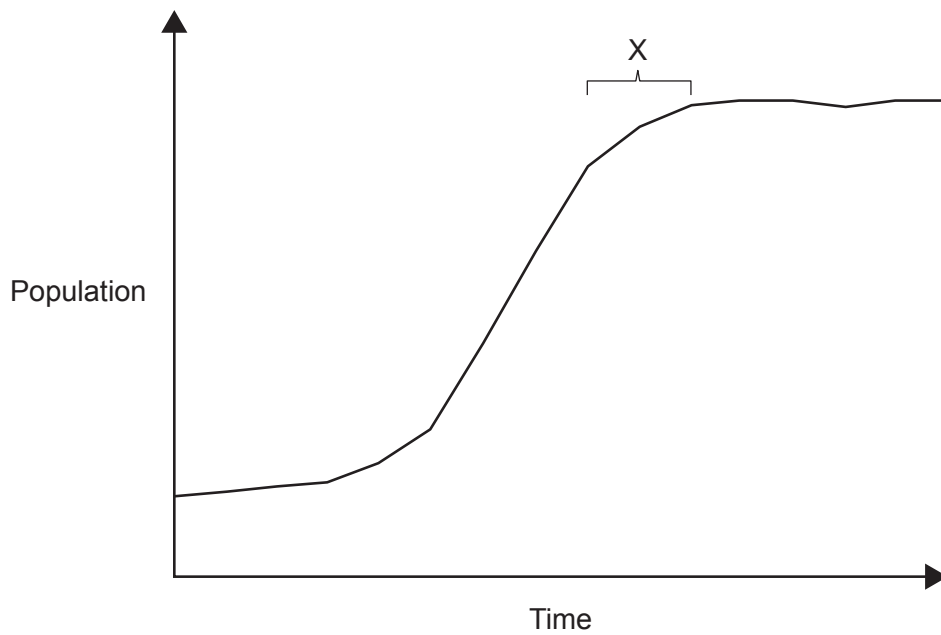
What could be deduced from this data?

- A. Predation results in *P. caudatum* consuming *P. aurelia*.
- B. Allelopathy results in *P. caudatum* outcompeting *P. aurelia*.
- C. Interspecific competition results in *P. aurelia* outcompeting *P. caudatum*.
- D. Intraspecific competition results in *P. aurelia* eliminating *P. caudatum*.

- 26.** *Bifidobacteria* living in human intestines can synthesise several B vitamins, such as folate and riboflavin. What is the type of interspecific relationship between these bacteria and humans?
- A. Pathogenicity
 - B. Predation
 - C. Parasitism
 - D. Mutualism

Turn over

27. The graph shows a population growth curve.



What factor could cause the part of the graph indicated by X?

- A. Increased food supply
- B. Increased disease
- C. Reduced predation
- D. Reduced competition

26. Which interspecific relationship has a negative impact on both individuals?

- A. Competition
- B. Mutualism
- C. Parasitism
- D. Pathogenicity

Turn over

27. Root nodules in a plant of the Fabaceae (legume) family is an example of a type of interspecific relationship that involves bacteria.



Which of the following explains the relationship between the species?

- A. It is mutualistic, as bacteria obtain oxygen for respiration and provide carbon dioxide for plant photosynthesis.
- B. It is mutualistic, as the plant supplies bacteria with sugars and obtains ammonium for protein synthesis.
- C. It is parasitic, as bacteria take nutrients from the plant causing poor plant growth.
- D. It is parasitic, as bacteria obtain water from roots, which reduces plant photosynthesis.

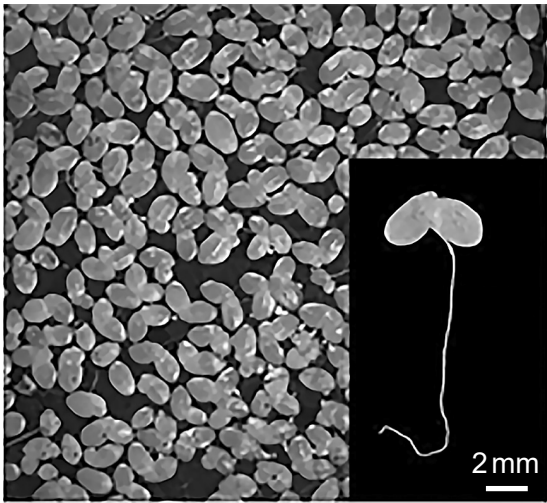
Turn over

- 28.** Black walnut (*Juglans nigra*) secretes the chemical juglone into the soil surrounding its roots. Juglone inhibits cell respiration in other species of plants. What does this example illustrate?
- A. Mutualism
 - B. Intraspecific competition
 - C. Allelopathy
 - D. Parasitism

29. Which is a density-independent limiting factor for a kangaroo?

- A. A forest fire
- B. Predation
- C. Climate change
- D. Eutrophication

3. Duckweed (*Lemna minor*) is a small flowering plant that floats on water. Duckweed can reproduce rapidly using asexual reproduction, giving rise to dense populations.



A group of students investigated the effect of temperature on the rate of population growth of duckweed. They set up three culture dishes using 500ml of filtered pond water with a pH of 7.0. The culture dishes were given a small starting population of plants and each dish was incubated at a fixed temperature (15, 20 or 25 °C).

The number of duckweed plants in each dish was counted over several weeks. The data are summarized in the table.

Time / weeks	Number of plants at a given temperature		
	15 °C ± 1 °C	20 °C ± 1 °C	25 °C ± 1 °C
0	5	5	5
1	10	14	15
2	31	37	50
3	38	76	80
4	24	115	117
5	23	168	177

- (a) Outline what indicates that temperature is the independent variable in this experiment. [1]

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(This question continues on the following page)



(Question 3 continued)

(b) Identify the temperature that gives the highest overall population growth rate over the experimental period. [1]

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(c) Explain how temperature can influence population growth in a species such as *Lemna minor*. [2]

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(d) Suggest how the reliability of this investigation could be improved. [1]

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Turn over

Section A

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

5. Many flowering plants require an animal pollinator in order to transfer pollen from one flower to another.



- (a) Explain the type of ecological relationship between the hummingbird and the flower on which it feeds.

[2]

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- (b) State **one** way that plants attract animal pollinators.

[1]

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- (c) Hummingbirds have few natural predators. Suggest **one** type of behaviour that an animal such as a hummingbird can display to reduce the risk of predation while it is feeding.

[1]

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Turn over