

Populations & Sustainability

Model Answers 2

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Genetics, evolution and ecosystems
Topic	Populations & sustainability
Booklet	Model Answers 2

Time allowed: 34 minutes

Score: /25

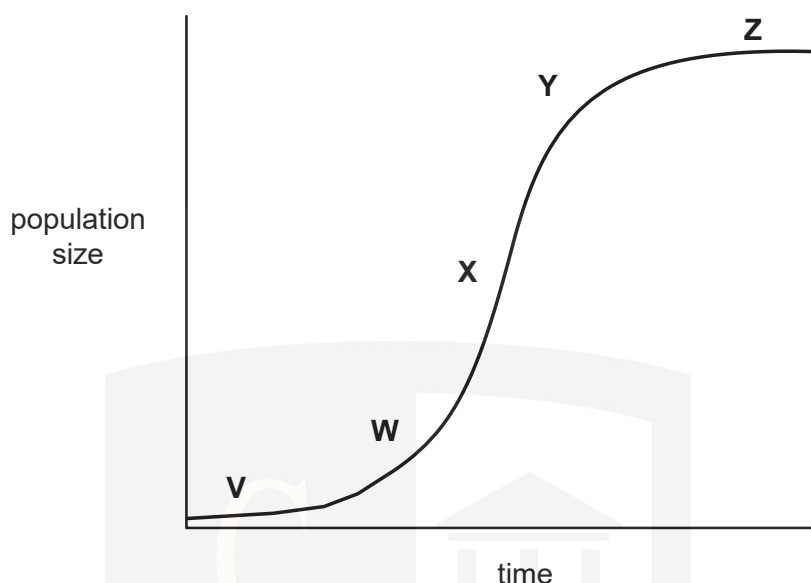
Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

The graph shows a typical population growth curve.



Which row correctly describes what is happening at each of stages V to Z?

	V	W	X	Y	Z
A	reproduction rate is higher than death rate	as time doubles population doubles	population size is proportional to time	population growth is slowing	reproduction rate is similar to death rate
B	reproduction rate is higher than death rate	as time doubles population more than doubles	reproduction rate is much higher than death rate	population growth is slowing	reproduction rate is similar to death rate
C	reproduction rate is higher than death rate	as time doubles population doubles	population size is proportional to time	population growth is decreasing	reproduction rate is similar to death rate
D	reproduction rate is higher than death rate	population is increasing rapidly	reproduction rate is much higher than death rate	population is decreasing	reproduction rate is similar to death rate

[1]

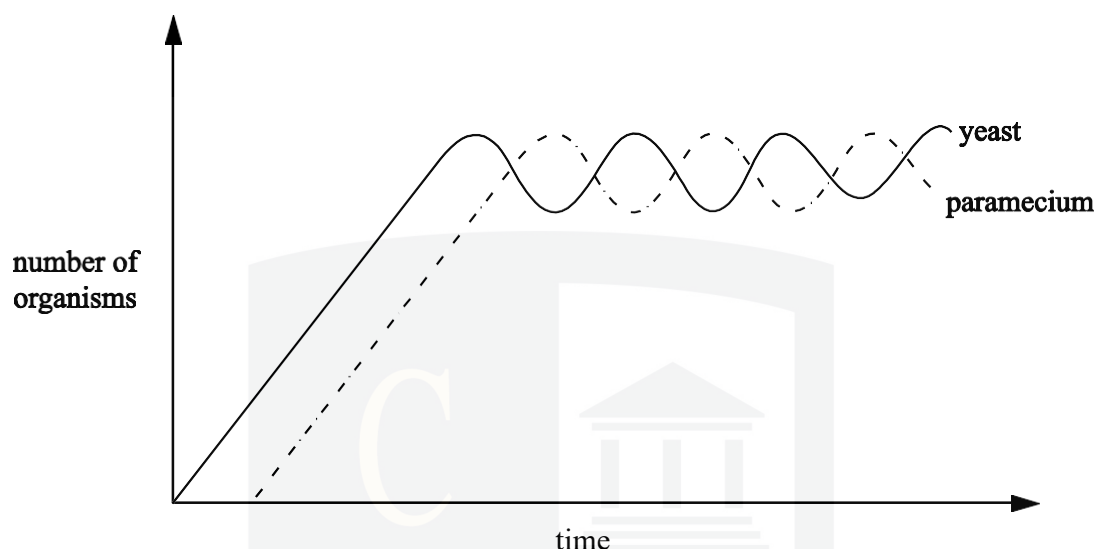
V is the LAG phase, reproduction even though slow is still greater the death rate as the curve is still rising

W and X are the exponential phase or LOG

At Y the population growth is slowing but it is still going UP and NOT decreasing otherwise it would go down

Question 2

The graph shows a population of yeast and a unicellular organism, *Paramecium*, grown in a fermentation chamber.



Which **one** of the following statements best describes the relationship between the two organisms?

- A. The *Paramecium* and yeast populations are complementary to each other.
- B. The yeast thrives in the relationship at the expense of the *Paramecium* population.
- C. The *Paramecium* feeds on the yeast and reduces the number in the yeast population.
- D. The two populations are in equilibrium and stable due to a type of negative feedback.

[1]

You could be forgiven for putting C however the data does not show that *Paramecium* is actually feeding on the yeast. In negative feedback, a rise in one variable causes a drop in the other variable

Question 3

The elk, *Cervus canadensis*, is a large herbivore.

Fig. 2.1, **of the Insert**, shows figures relating to the number of elk in Yellowstone National Park in the USA between 1965 and 2002.

The figures were obtained in two different ways:

- the white bars show estimated numbers of live elk obtained by ecological sampling
- the black bars show numbers of elk that were legally shot by hunters.

In some years no data for live elk were obtained.

- (a) (i) Using Fig. 2.1, describe the pattern shown by the data for the estimated number of live elk from 1965 to 2002. [3]

- The estimated number of elk peaks in 1988 or 1994
- The trend decreases after 1994
- Between 1988 and 1994 the trend decreases then increases
- Overall the numbers increase from 1965 to 2002

- (ii) The recorded number of elk legally shot by hunters provides accurate data.

Suggest why these data are accurate, but the method used to obtain these data is not a valid way of estimating the number of elk in the population.

- The data is accurate because it is the actual number of elk being shot that is recorded [2]
- However the method is not valid because the number of elk shot depends on the success of the hunting and varies independently of population size

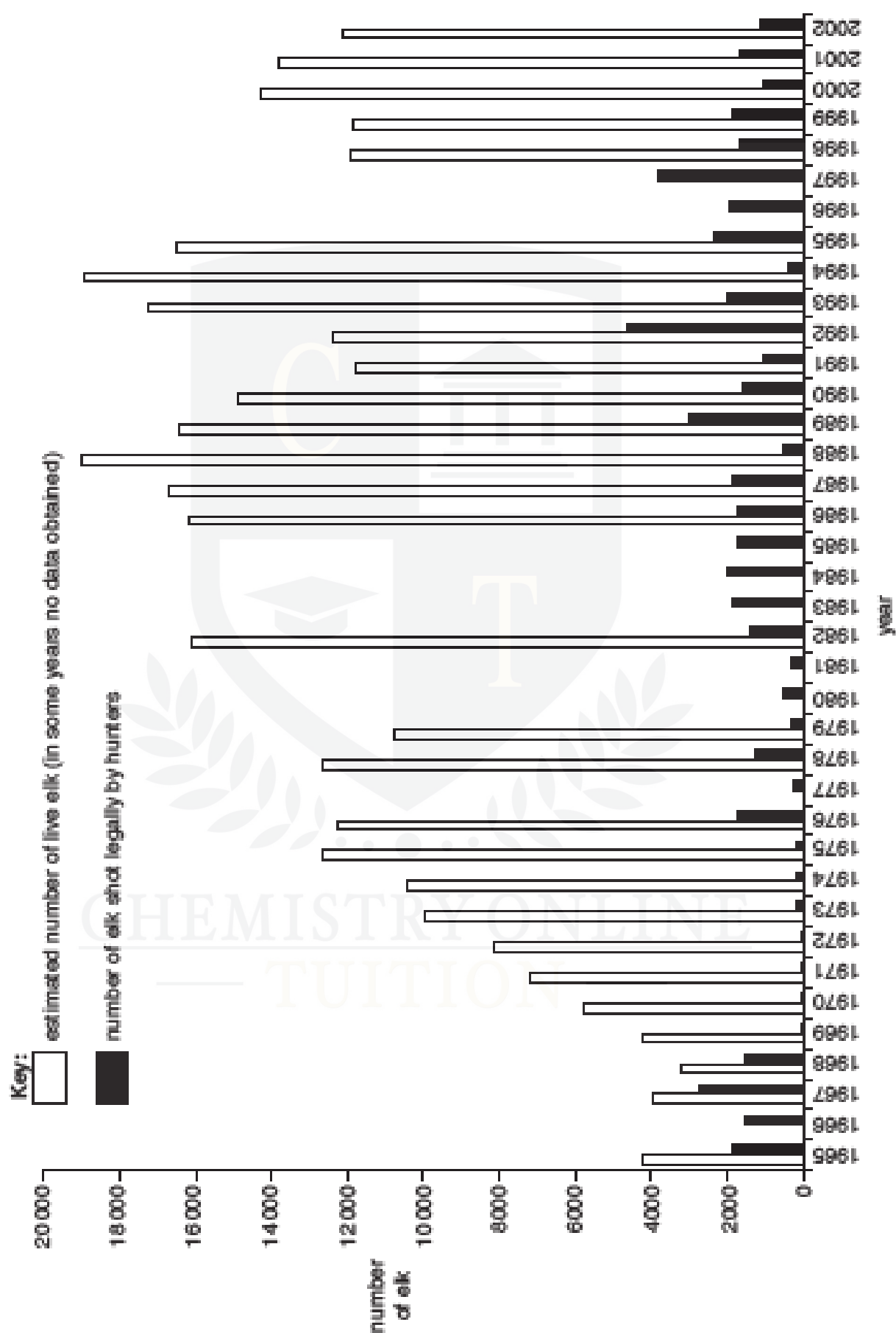


Fig. 2.1

(b) The grey wolf, *Canis lupus*, is a large predator whose diet includes elk.

By 1926, grey wolves had been hunted to extinction in Yellowstone Park. However, this species could still be found in other parts of the world.

In 1995, a population of grey wolves was introduced to Yellowstone Park and their numbers increased.

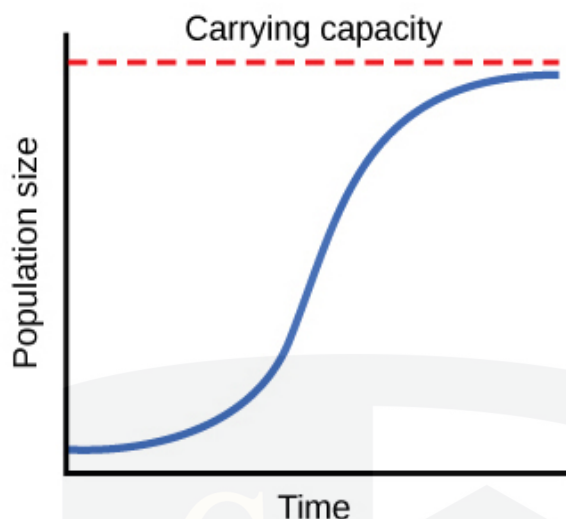
(i) With reference to Fig. 2.1, discuss the factors that may have affected the size of the elk population:

- before 1995
- after 1995.



In your answer you should provide a balanced account referring to factors before and after 1995.

- Before 1995 there is plenty of food, less predation and less overcrowding, these [7]
would all normally limit a population
 - Before 1995 the population levels off because it reaches its carrying capacity
 - The population could become limited by intraspecific competition between the
roads for a resource such as food
 - They could also become limited by competition with different species otherwise
known as interspecific competition
 - Populations can decline at any time as a result of severe weather
 - The decrease before 1995 could not be due to wolves as they were non-present
- Carrying capacity is the maximum population that can be sustained in a population.
Limiting factors such as predation and availability of food prevents the population from
increasing any further



(ii) Explain why the introduction of wolves to Yellowstone Park in 1995 is an example of conservation.

[2]

- Conservation maintains biodiversity
- It involves active and dynamic management prevents over population by the elks and prevents overgrazing of the habitat

The difference between preservation and conservation. Conservation is the active management of a habitat by human activity such as selective felling of trees, creating paths and walkways to avoid areas that would be easily damaged. Providing nest boxes and educating the public are all ways of conserving habitats. Preservation is when an area is completely cordoned off, access to the public is denied and it's left to develop as a result of natural processes, there is no human interference.

[Total: 14]

Question 4

- (a) Great tits, *Parus major*, are birds that form male-female pairs. The male of each pair then establishes an area of territory, which he defends against other great tits by singing and threat displays.

The birds build a nest within the territory in which the eggs are laid and young chicks are reared. Weasels, *Mustela nivalis*, are predators which eat eggs and young chicks.

Fig. 6.1 shows how the territory size of great tits affects the risk of nest predation by weasels.

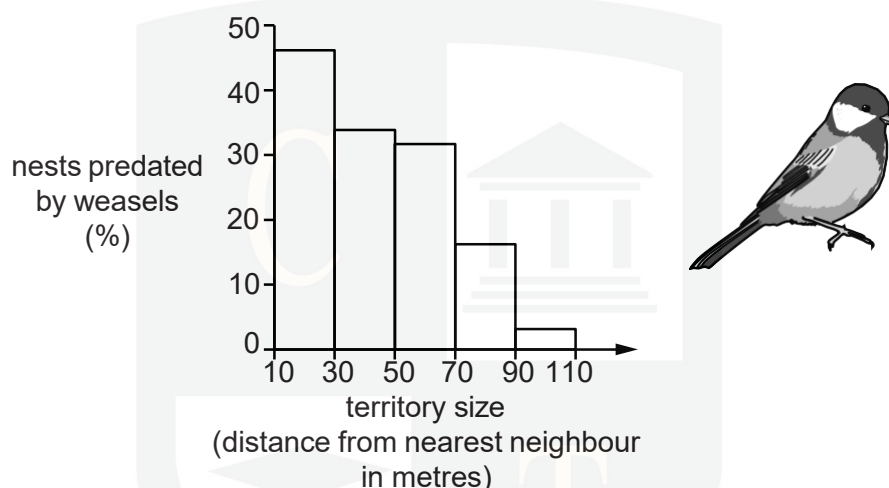


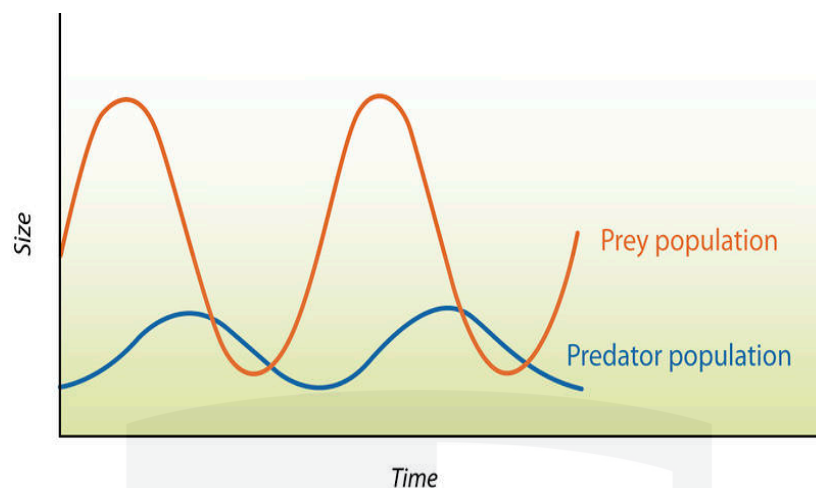
Fig. 6.1

- (i) Describe the relationship shown in Fig. 6.1. [1]

- The graph shows that the larger the territory and greater distance between neighbours then there is less predation

- (ii) Suggest and explain what effect weasels may have on the population size of the great tit. [2]

- Weasels helps to keep great tit numbers stable
- As great tit numbers increase the numbers of weasels which are predators increases
- The predation by weasels is density dependent



(b) The ochre starfish, *Pisaster ochraceus*, is a starfish that lives on rocky intertidal shores. It is the top predator in its habitat.

Fig. 6.2 shows part of the food web for this starfish.

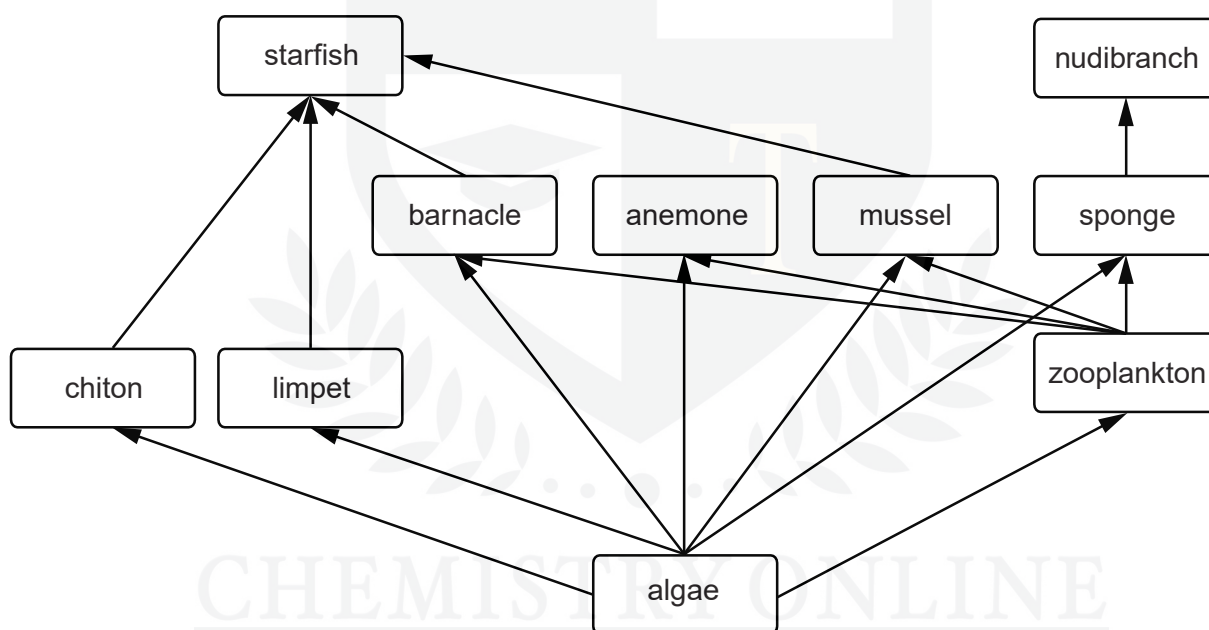


Fig. 6.2

An experiment was carried out in which all the starfish were removed from an 8 m × 2 m area of the shore. In an equivalent area of the same size, the starfish were not removed.

The population sizes of the other organisms in the food web were monitored at intervals. It was found that in the area in which starfish were removed:

- chitons and limpets disappeared
- anemones, sponges and nudibranchs decreased in abundance.

(i) Explain why two areas of the same size were monitored. [2]

- The two areas of the same size were monitored as a control to compare the effect of removal of the starfish
- They were the same size to make the test valid and unbiased

(ii) Using Fig. 6.2, explain why the chitons and limpets disappeared in the area from which starfish were removed. [2]

- The chitons and limpets disappeared when the starfish were removed as a result of interspecific competition
- This was from barnacles and mussels
- The competition was for algae and space on the rocks
- The barnacles and mussels thrived because they were no longer being eaten by the starfish

(iii) Using Fig. 6.2, suggest the sequence of events that led to the decrease in abundance in nudibranchs in the area from which starfish were removed. [2]

- As a result of removal of starfish, the populations of mussels and barnacles would increase
- Added competition by mussels and barnacles will reduce the numbers of sponges
- Fewer sponges would provide less food for nudibranchs
- Nudibranch numbers would drop as they have only one source of food which are the sponges

[Total: 9]