

1 *Daphnia* is a small arthropod animal found in freshwater. The population of *Daphnia* in a lake in Oregon (in the northern temperate region) was sampled at regular intervals between March and November in 2006 and 2007. During 2006 there were very few *Daphnia* in any of the samples. At the end of that year fish were removed from the lake.

- The population of *Daphnia* in March, April and May 2007 was 1 animal per m³ of water sampled.
- The population then increased exponentially to 100 000 per m³ at the beginning of July.
- By the end of August the population had decreased to 10 000 per m³ and the population remained at this number until the end of November.

(a) Sketch a line on Fig. 6.1 to show the population of *Daphnia* from March to the end of November 2007. [3]

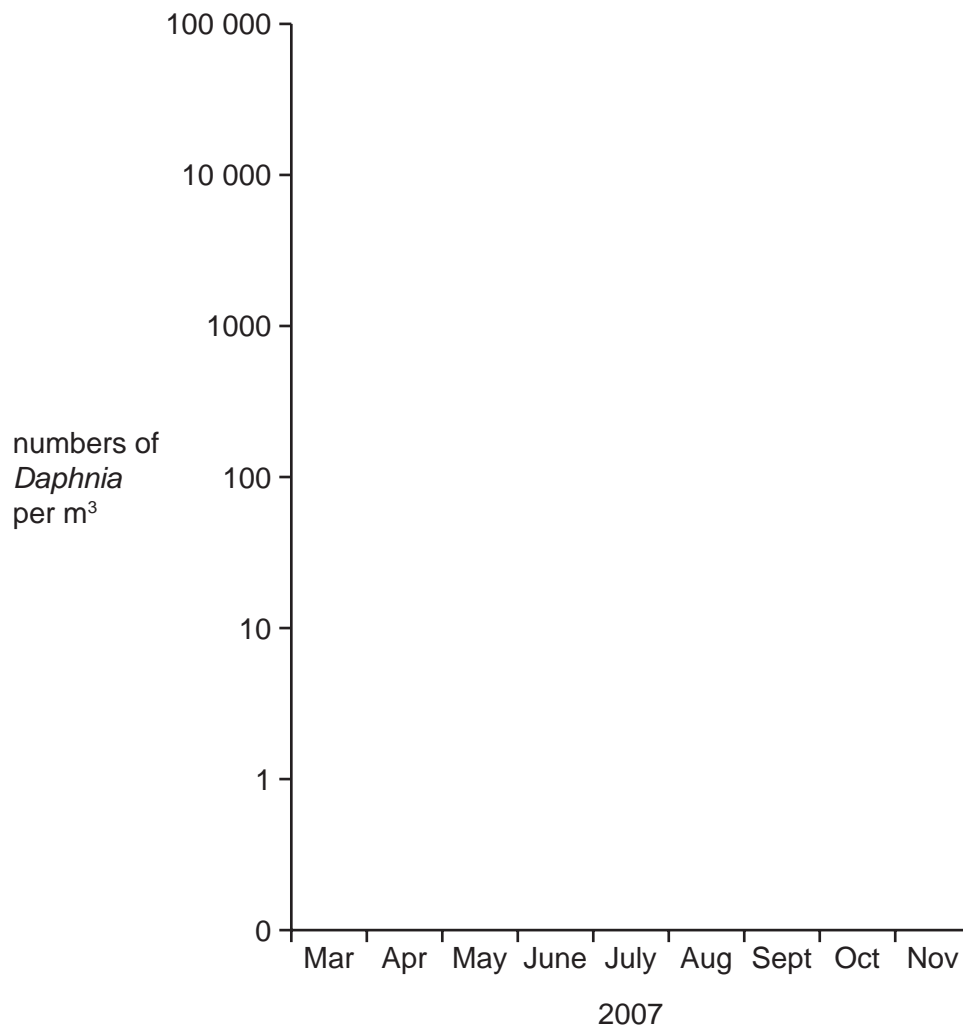


Fig. 6.1

(b) Suggest why there were very few *Daphnia* present in the lake in 2006.

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..... [2]

(c) Explain the changes in the population of *Daphnia* in 2007.

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..... [4]

[Total: 9]

2 (a) List four chemical elements that are found in proteins.

1.
2.
3.
4. [4]

Fig. 6.1 is a photograph of some root nodules from a pea plant, which is a type of legume.



Fig. 6.1

(b) Nodules like those in Fig. 6.1 develop on the roots of pea plants and other legumes when the soil is lacking in nitrate ions.

Explain what happens inside the nodule to help legume plants grow in soils lacking nitrate ions.

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- [3]

- (e) The soya bean aphid is an insect pest of soya bean plants in North America. The aphids can show an exponential growth rate where populations can double in two to three days under favourable conditions.

Fig. 6.2 shows the growth of soya bean aphids in a field in North America during the growing season.

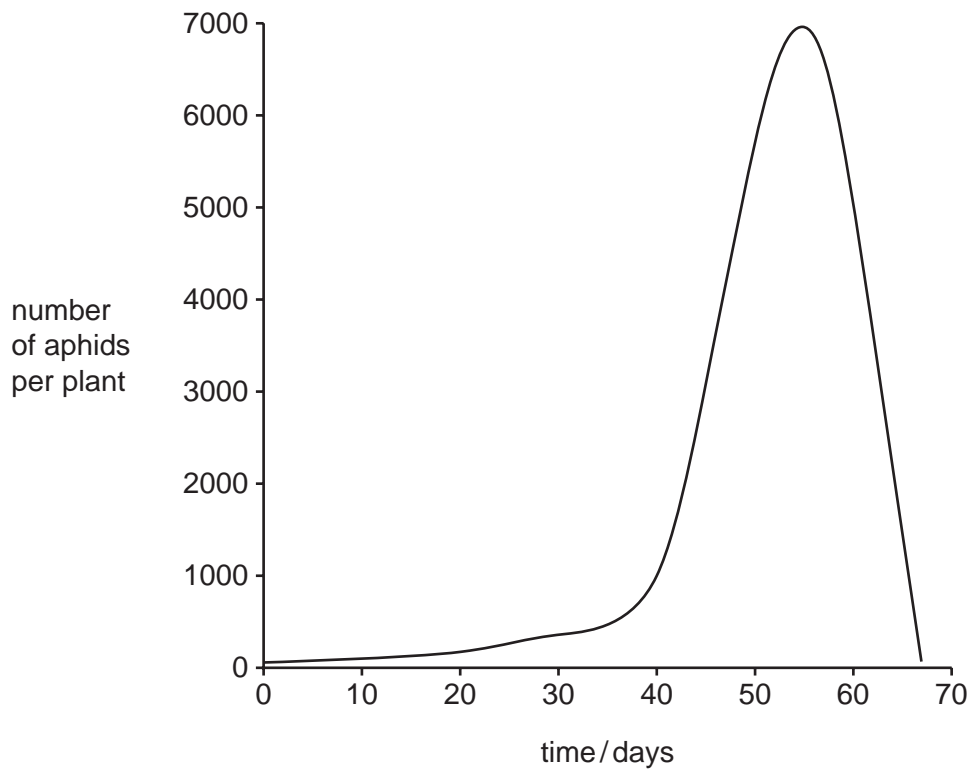


Fig. 6.2

Suggest why the population of aphids did not increase rapidly until about day 40.

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..... [3]

[Total: 19]

- 3 The wild dog is one of the smaller African carnivorous mammals. It has disappeared from 25 of the 39 countries where it used to live. Wild dogs hunt in packs, feeding on antelopes, which are grass-eating mammals.

A conservation programme has been started to increase the wild dog population in South Africa. Farmers are worried about numbers getting out of control because wild dogs breed at a very fast rate. However, conservationists are not concerned because the lion is a natural predator of the dogs.

(a) Wild dogs are carnivorous mammals.

(i) Define the term *carnivore*.

..... [1]

(ii) State **one** external feature which distinguishes mammals from other vertebrates.

..... [1]

(b) Suggest two reasons why numbers of African wild dogs are decreasing.

1.

2. [2]

(ii) Suggest what could happen to the species if numbers continue to decrease.

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..... [1]

(c) Using the information in the passage above, construct a food chain for a wild dog, including its predator.

Label each organism with its trophic level.

(d) It is important that the wild dog species is conserved.

(i) Explain the meaning of the term *conservation*.

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..... [2]

(ii) Outline the measures that could be taken to conserve a mammal, such as the wild dog.

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..... [3]

(e) When wild dogs die, nitrogen compounds in their bodies may become available for plants. Outline the processes that occur to make these nitrogen compounds in the bodies of dead animals available for plants to absorb.

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..... [5]

[Total: 19]