Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Organisms and their environment

Time allowed: 1 hour 25 minutes

Subject code **0610**

Biology

Questions from Paper 3 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 90

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 90 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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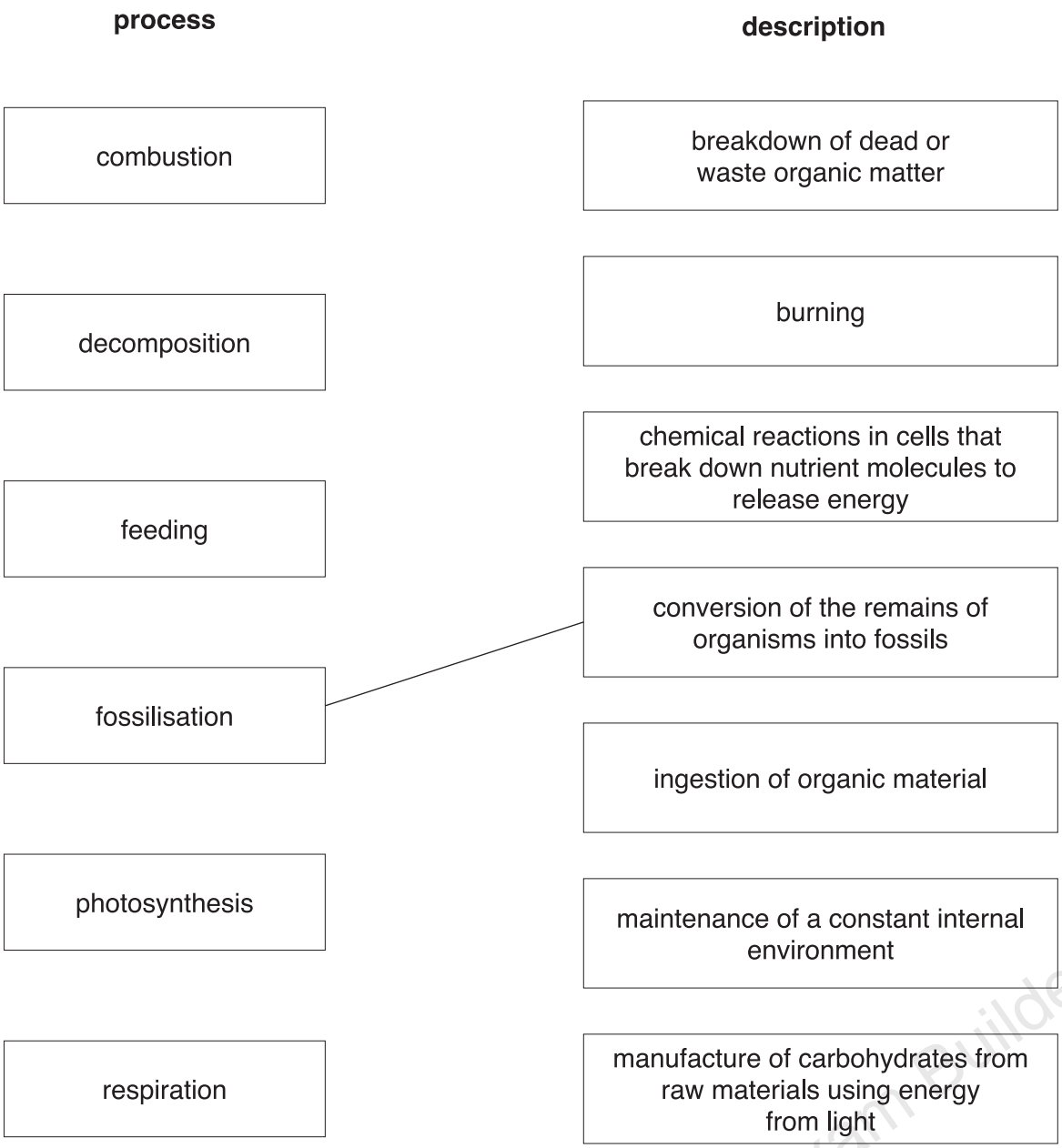
Print at 100% (Actual size) so diagrams keep their real measurements.

1 The boxes on the left contain the names of processes from the carbon cycle.

The boxes on the right contain some descriptions of processes.

Draw **one** straight line from each process to link the process to its description.

An example has been done for you.



[5]

[Total: 5]

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Carbon, nitrogen and water cycles Click for more variations

2 Fig. 9.1 shows a food web.

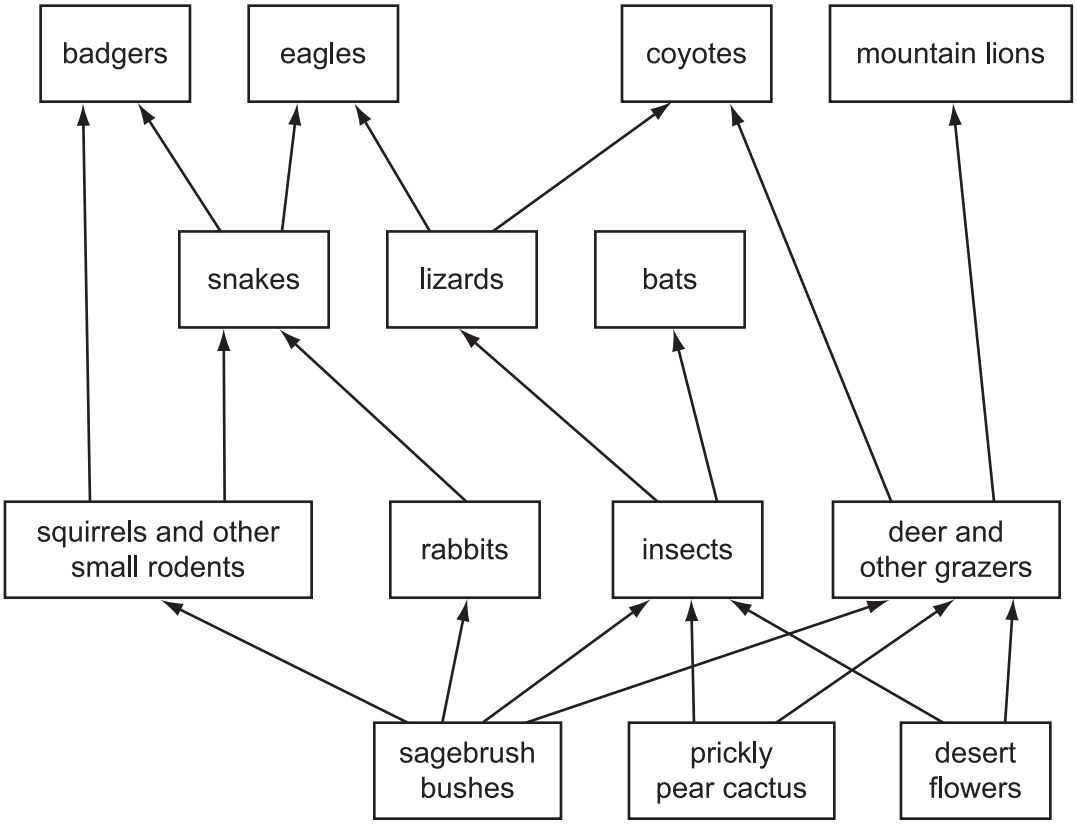


Fig. 9.1

(a) Explain the difference between a food web and a food chain.

.....

.....

.....

..... [2]

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(b) From the food web name:

(i) a carnivore; .....

(ii) a producer; .....

(iii) a consumer from the 2nd trophic level. ..... [3]

(c) In some regions, mountain lions have been hunted and face extinction.

Suggest how the coyotes might be affected if the mountain lion became extinct.

.....

.....

.....

.....

.....

..... [3]

[Total: 8]

Food chains, food webs and energy flow Click for more variations

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3 **(a)** The boxes on the left show two terms.

The boxes on the right show the descriptions of some terms.

Draw **one** line to link each term to its description.

Draw **two** lines.

term	description
	a group of organisms that can reproduce to produce fertile offspring
	all of the populations of different species in an ecosystem
community	
	an organism that gets its energy by feeding on other organisms
	a group of organisms of one species, living in the same area, at the same time
population	
	the position of an organism in a food chain, food web or ecological pyramid
	a unit containing the different species of organisms and their environment, interacting together

[2]

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(b) The growth of bacteria in a flask containing nutrients was monitored for six hours.

The number of **live** bacteria per cm^3 was estimated every 30 minutes.

Fig. 6.1 shows the results.

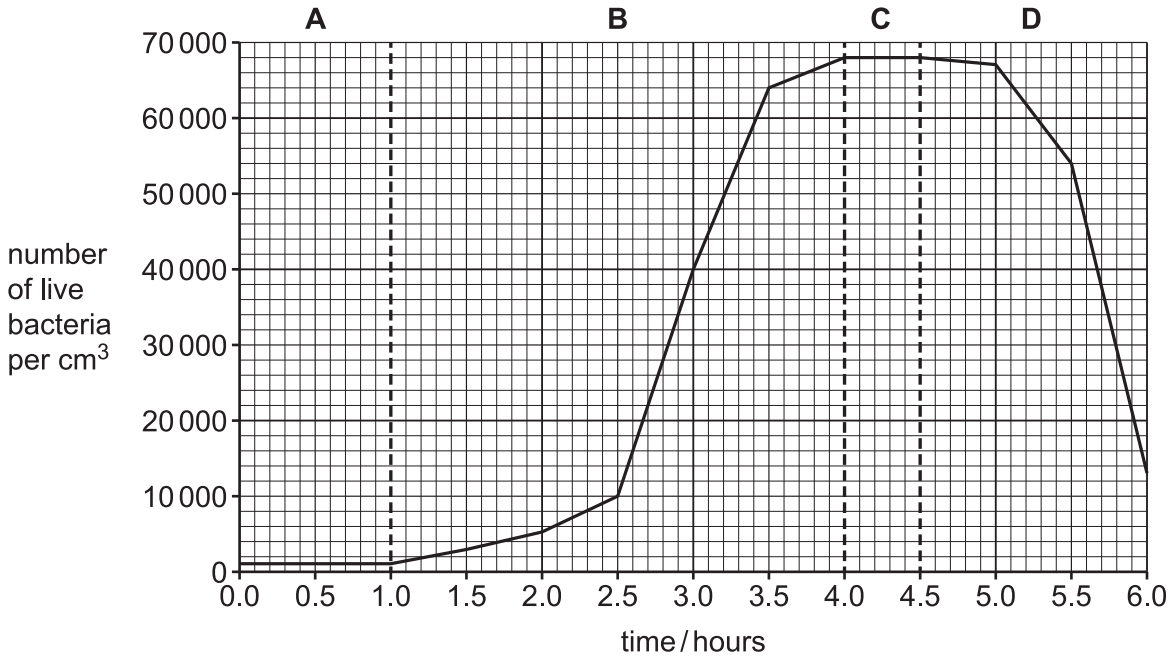


Fig. 6.1

(i) The data in the graph has been divided into four phases: **A**, **B**, **C** and **D**.

The list shows the names of the four phases.

death **exponential** **lag** **stationary**

Use the words from the list to identify phases **A**, **B**, **C** and **D** shown in Fig. 6.1.

A .....

B .....

C .....

D .....

[2]

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(ii) Complete the sentences using the data shown in Fig. 6.1 and your knowledge.

The number of live bacteria in phase **A** remained at .....

per cm^3.

In phase **B** the number of live bacteria doubled between 2.0 hours and

..... hours.

The maximum number of live bacteria occurred in phase ..... .

In phase ..... the number of live bacteria decreased because the bacteria did not have enough ..... .

[5]

[Total: 9]

Populations Click for more variations

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4 Fig. 5.1 shows a food web.

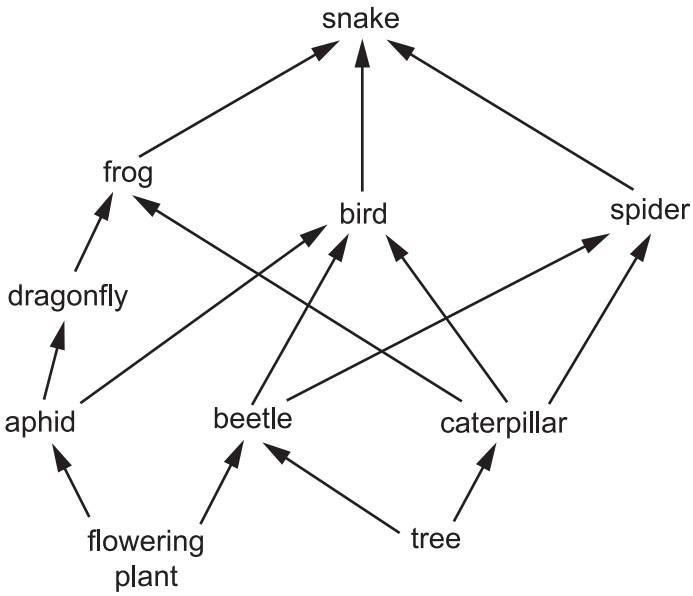


Fig. 5.1

(a) (i) Complete Table 5.1 using the information in Fig. 5.1.

One has been done for you.

Table 5.1

	number shown in Fig. 5.1
producers	2
herbivores	
primary consumers	
carnivores	

[3]

(ii) State the name of **one** organism in Fig. 5.1 which obtains its energy from eating three different organisms.

..... [1]

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(b) A disease killed most of the snakes in the food web in Fig. 5.1.

Complete the sentences by circling the correct words **in bold**.

The first one has been done for you.

The population of snakes **increases / (decreases) / stays the same** .

The population of spiders **increases / decreases / stays the same** because there is less **predation / food / competition** .

The population of caterpillars **increases / decreases / stays the same** because there is more **predation / food / competition** .

[2]

(c) Decomposers are not shown in the food web in Fig. 5.1.

Complete the definition of the term decomposer.

A decomposer is an organism that gets its ..... from dead or waste ..... material.

[2]

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(d) Fig. 5.2 shows a food chain.



Fig. 5.2

Table 5.2 shows the number of organisms in this food chain and some of the information needed to draw a pyramid of numbers.

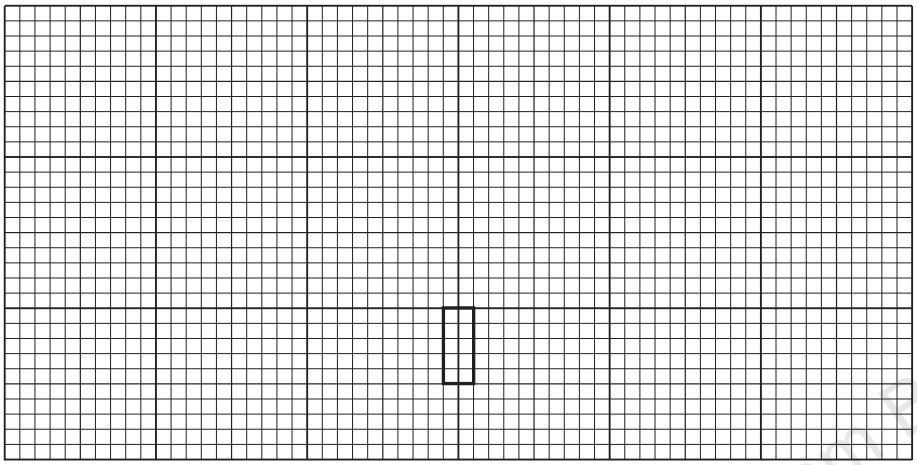
Table 5.2

organism	number of organisms	width of bar in pyramid / mm
bird	2	
caterpillar	20	80
cabbage	1	4

(i) Complete Table 5.2 by calculating the missing value and writing it in the table. [1]

(ii) Complete the pyramid of numbers on the grid for the food chain shown in Fig. 5.2 using the information in Table 5.2. The bar for the cabbage has been done for you.

Label the organisms on the pyramid of numbers.



[3]

[Total: 12]

Food chains, food webs and energy flow Click for more variations STEM | Exam Builder

5 **(a)** The flow chart in Fig. 6.1 shows one pathway of nitrogen as it travels through the nitrogen cycle.

Complete the flow chart in Fig. 6.1.

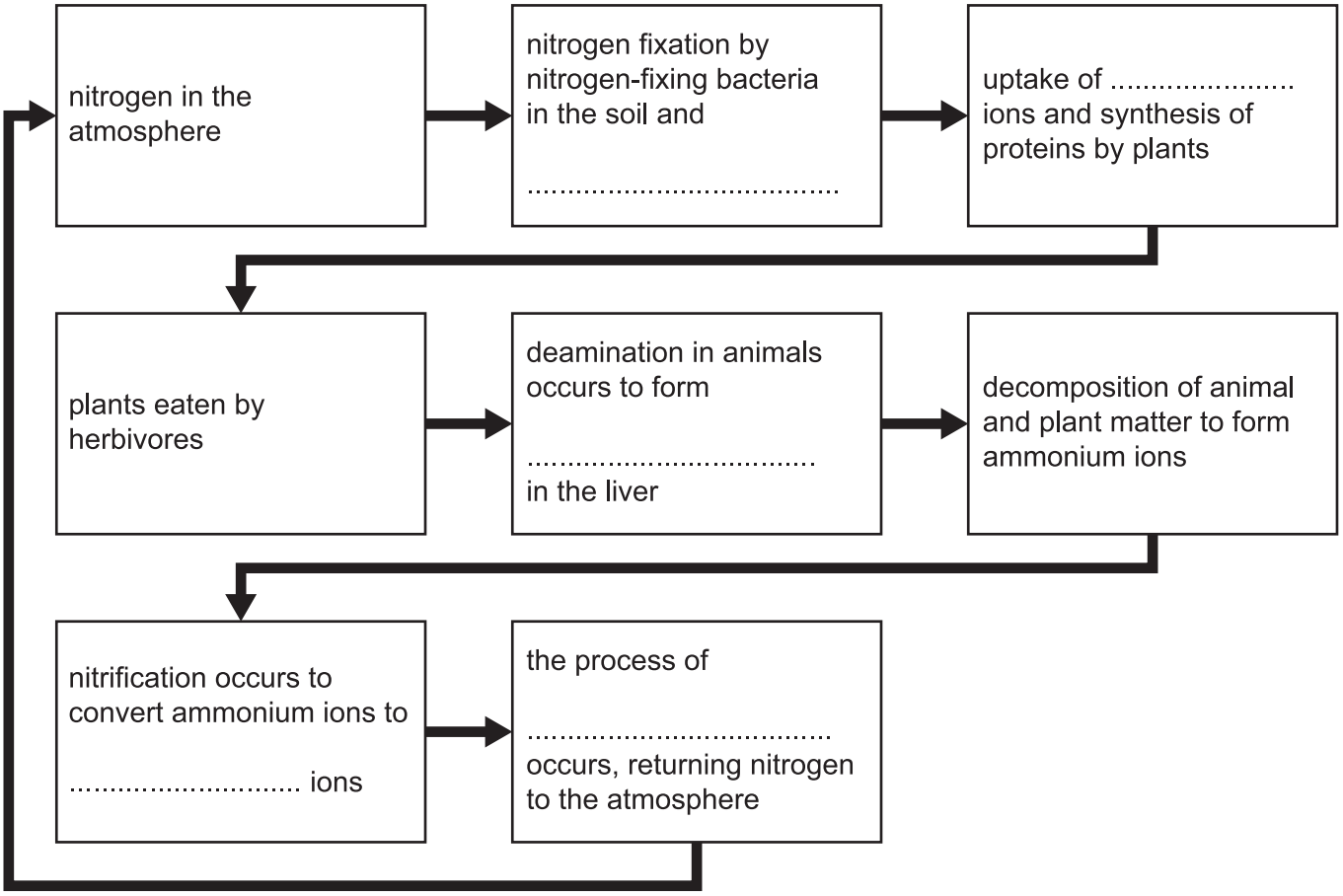


Fig. 6.1

[5]

(b) State the names of **two** processes that occur in both the carbon and nitrogen cycles.

1 .....

2 .....

[2]

(c) State the principal source of energy input to biological systems.

..... [1]

[Total: 8]

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Carbon, nitrogen and water cycles Click for more variations

6 Many biologists study populations of organisms in their natural habitats.

(a) Define the term *population*.

.....

.....

.....

..... [2]

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(b) A 10-year study was carried out to investigate the relationship between voles and owls. Voles are small mouse-like mammals and owls are carnivorous birds.

The results are shown in Fig. 6.1 and Fig. 6.2.

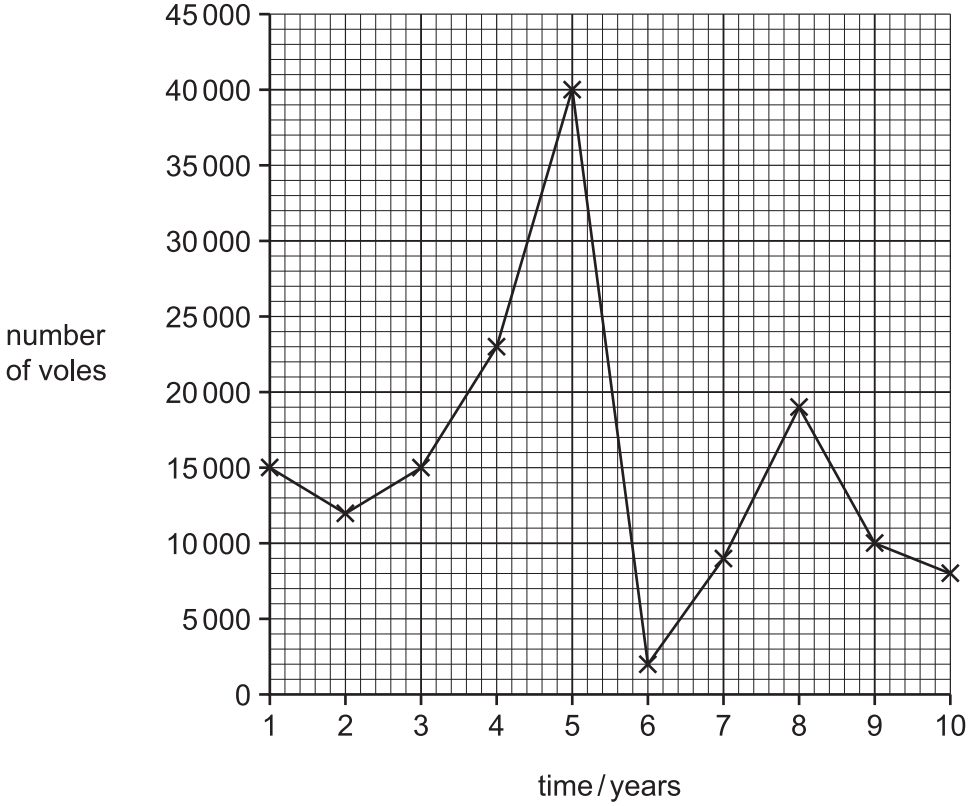


Fig. 6.1

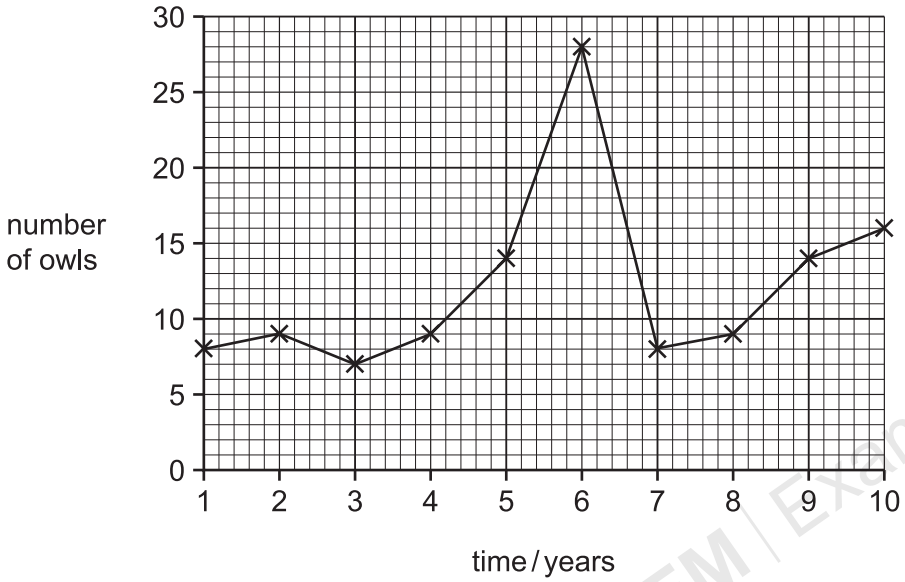


Fig. 6.2

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(i) Suggest **three** reasons for the decrease in the population of voles between years 5 and 6.

1 .....

.....

2 .....

.....

3 .....

..... [3]

(ii) State the evidence from Fig. 6.1 and Fig. 6.2 that supports the idea that voles form a large part of the food eaten by owls.

.....

.....

.....

.....

.....

..... [2]

[Total: 7]

Populations Click for more variations

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7 The human population is growing rapidly. This is increasing the pressure on the world food supply.

(a) Name the rapid growth phase of any population of organisms.

..... [1]

In Canada farmers are breeding fish in large nets because the wild stocks of fish are decreasing. Fig. 6.1 is a diagram of a salmon fish farm in the ocean. The salmon only eat the food provided by the worker.

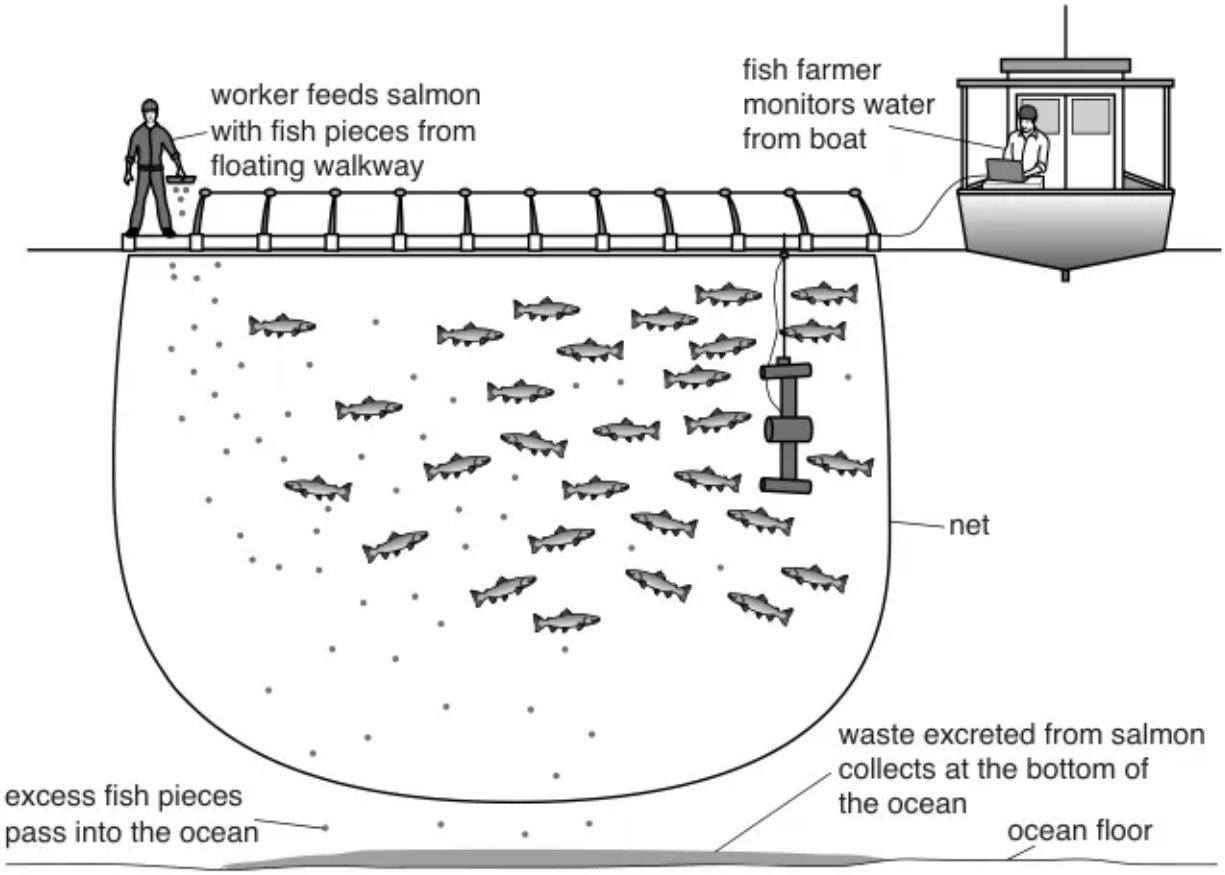


Fig. 6.1

(b) Explain the effects of the excess fish pieces and waste excreted from the salmon on the environment.

.....

.....

.....

.....

.....

.....

..... [3]

(c) State the lowest possible trophic level of the salmon shown in Fig. 6.1.

..... [1]

(d) Other farmers grow seaweed. Salmon farming is a less energy efficient way of producing food for humans than seaweed farming.

Explain why.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 8]

Pollution and climate change Click for more variations

8 *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 m^3 of water sampled.
- The population then increased exponentially to 100 000 per m^3 at the beginning of July.
- By the end of August the population had decreased to 10 000 per m^3 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]

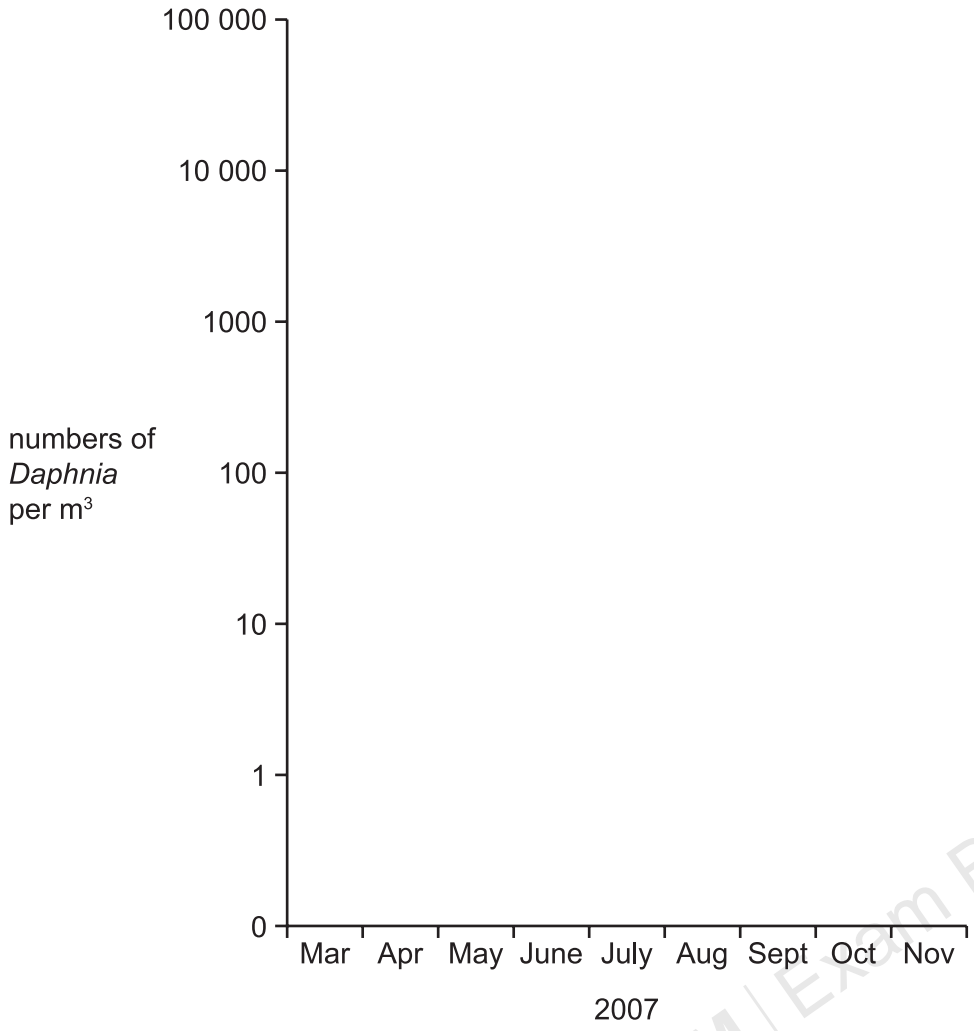


Fig. 6.1

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

[2]

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

[4]

[Total: 9]

Populations Click for more variations

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9 Fig. 2.1 shows the flow of energy through a natural ecosystem that is **not** used by humans at any of the trophic levels.

The unit of energy flow is kJ per m^2 per year.

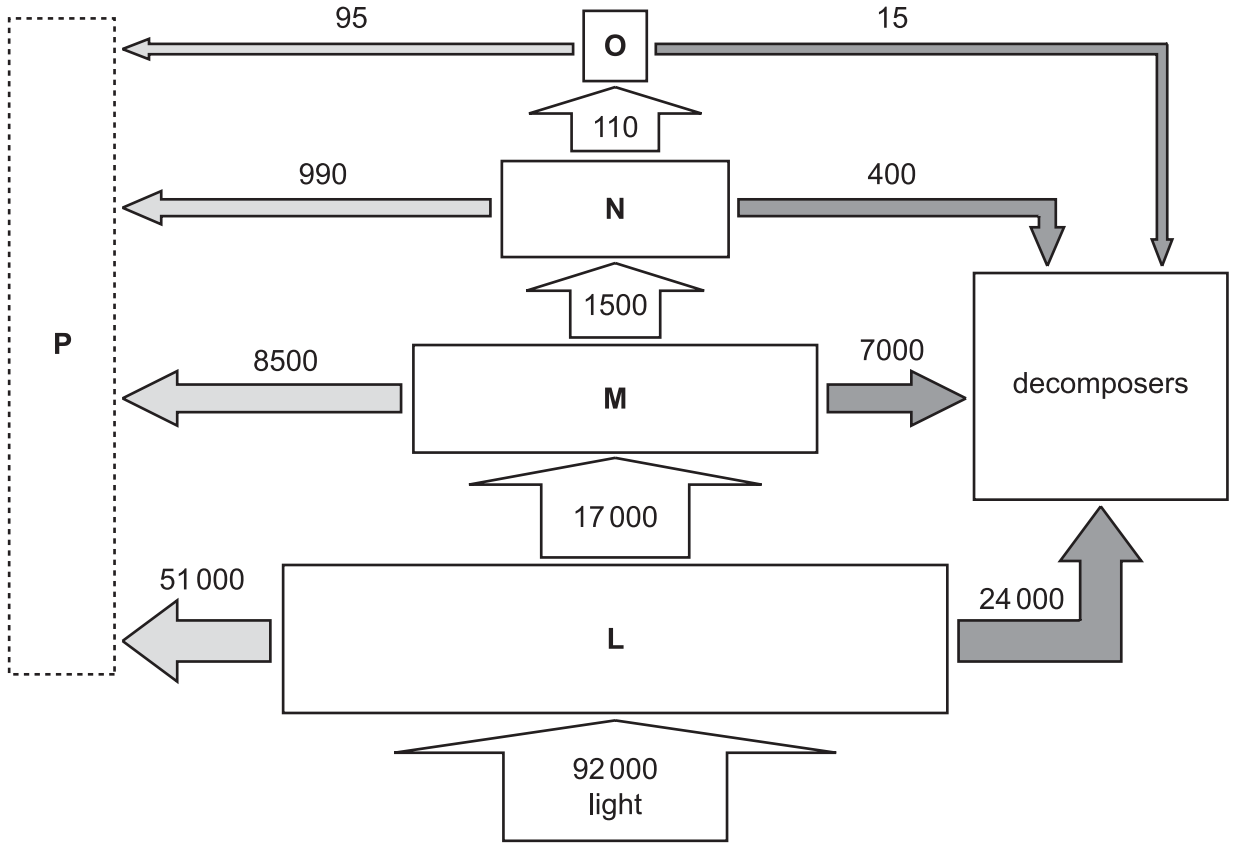


Fig. 2.1

(a) The letters **L** to **O** represent the different trophic levels in the ecosystem.

(i) Name the first and third trophic levels, **L** and **N**.

L .....

N ..... [2]

(ii) Suggest what is shown by the relative sizes of the boxes, **L** to **O**, in the energy flow diagram in Fig. 2.1.

..... [1]

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(iii) There are no predators in the ecosystem feeding on the animals in trophic level **O**.

Suggest **and** explain why there are no predators in the ecosystem feeding on the animals in trophic level **O**.

.....

.....

.....

.....

.....

..... [3]

(iv) **P** in Fig. 2.1 does **not** represent any organisms.

Explain what **P** represents in the energy flow diagram.

.....

.....

.....

..... [2]

(b) People who live near this ecosystem **would like** to use some of the organisms at trophic level **M** for food.

Suggest **and** explain what might happen to the ecosystem if the people took too many of the organisms at trophic level **M**.

.....

.....

.....

.....

.....

.....

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..... [3]

[Total: 11]

Food chains, food webs and energy flow Click for more variations

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10 **(a)** Fig. 1.1 shows a pyramid of energy for an ecosystem.

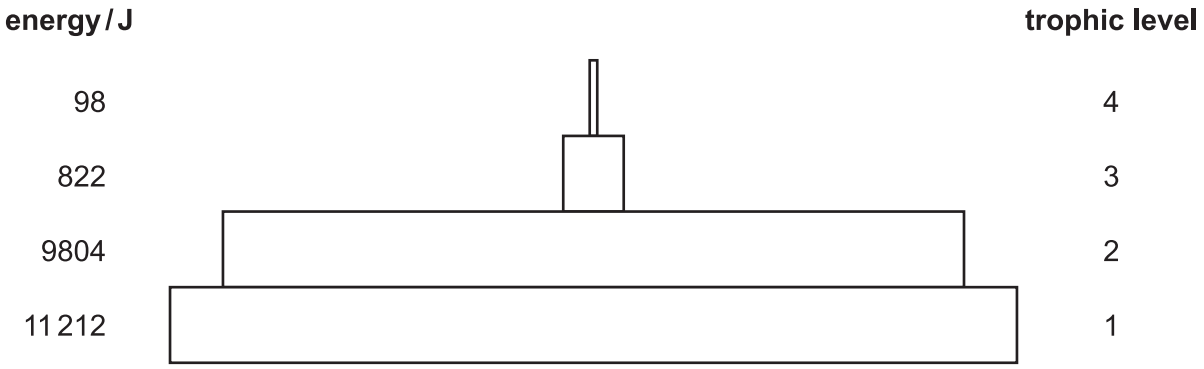


Fig. 1.1

(i) State where the organisms in trophic level 1 in Fig. 1.1 get their energy from.

..... [1]

(ii) Calculate the percentage of energy transferred between trophic levels 2 and 3 in Fig. 1.1.

Give your answer to **one** significant figure.

..... [2]

(iii) State **two** reasons why the energy decreases between trophic levels 1 and 4, as shown in Fig. 1.1.

1 .....

2 .....

[2]

(iv) Describe the advantages of representing food chains using a pyramid of energy compared with a pyramid of biomass.

.....

.....

.....

.....

..... [2]

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(b) A new species was introduced to an ecosystem.

Fig. 1.2 shows the changes in the population as the species established itself in the ecosystem.

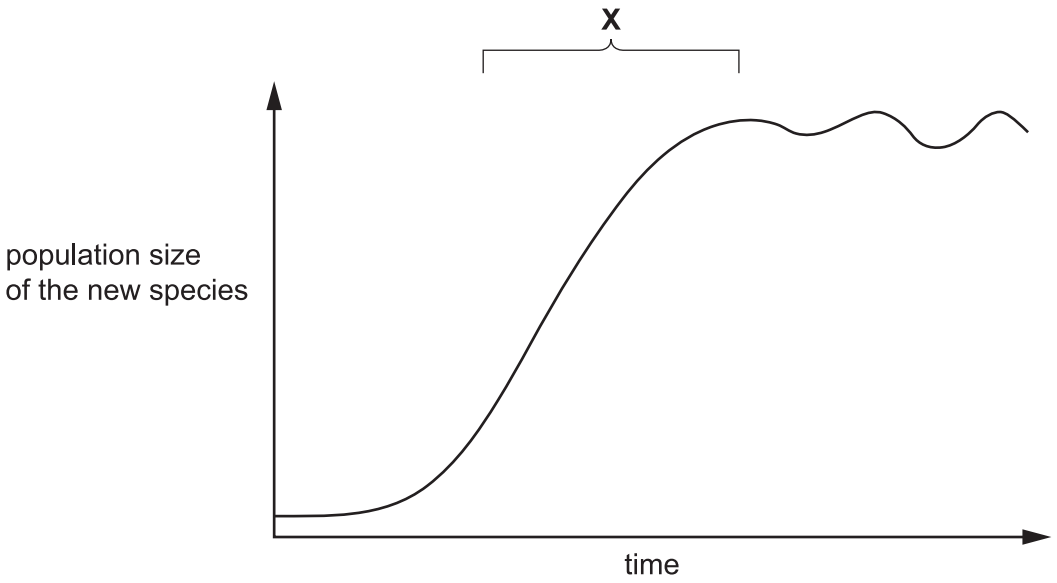


Fig. 1.2

(i) Complete the sentence to describe the term population.

A population is a group of organisms of one species living in the same ..... at the same ..... . [1]

(ii) Describe **and** explain the reasons for the shape of the graph at **X** in Fig. 1.2.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

[Total: 13]

Populations Click for more variations

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