19. Organisms and their environment

19.2 Food chains and food webs

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 Fig. 5.1 shows a pyramid of numbers for a food chain.

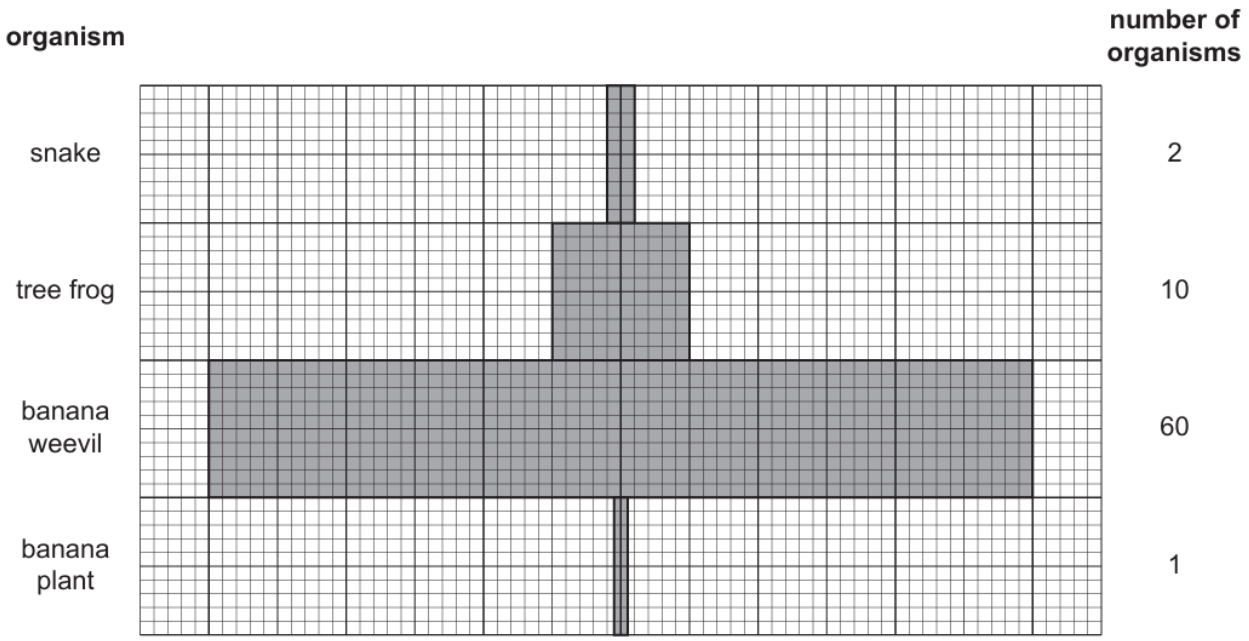

Fig. 5.1

(a) Write the food chain for the pyramid of numbers shown in Fig. 5.1.

..... [2]

(b) Identify the number of trophic levels in Fig. 5.1.

..... [1]

(c) The words in the list can be used to describe the organisms shown in Fig. 5.1.

carnivore **consumer** **decomposer** **herbivore** **producer**

Choose words from the list to describe the:

banana plant .....

tree frog ..... and ..... .

[3]

(d) State **one** advantage of using a pyramid of biomass rather than a pyramid of numbers.

.....

.....

..... [1]

2 Fig. 2.1 shows part of a food web for a coral reef. Algae and plankton are producers.

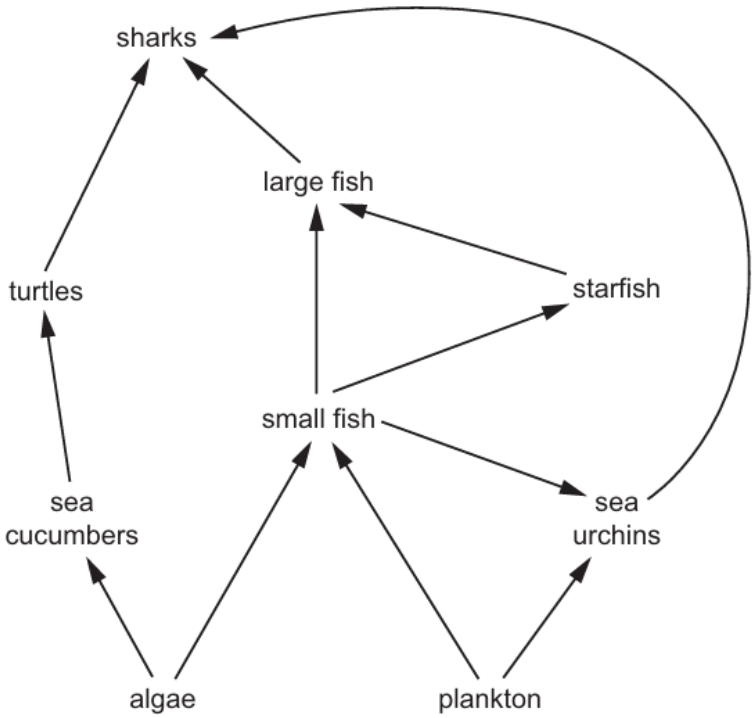

Fig. 2.1

(a) Using the information in Fig. 2.1, identify:

an organism that feeds at the third trophic level .....

a herbivore .....

a carnivore .....

an organism that is a primary consumer **and** a secondary consumer. .....

.....

[4]

(b) **(i)** State what the arrows in Fig. 2.1 represent.

..... [1]

(ii) Using the information in Fig. 2.1, construct a food chain containing **five** organisms.
Do **not** draw the organisms.

[2]

(iii) State the name of the process used by some producers to convert energy from light into chemical energy.

..... [1]

(iv) State the name of the type of organism that gets its energy from dead or waste organic material.

..... [1]

(c) The large fish in the food web is the coral grouper, *Cephalopholis miniata*.

Fig. 2.2 is a photograph of a coral grouper on a coral reef. Coral groupers are a popular food fish for humans.

Fig. 2.2

Overharvesting of the large fish would cause the turtle population to decrease.

Using the information in Fig. 2.1, explain why the turtle population would decrease.

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.....

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..... [3]

3 **(e)** Describe what is meant by the term carnivore.

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.....

..... [1]

4 **(a)** Fig. 4.1 shows a marine food web.

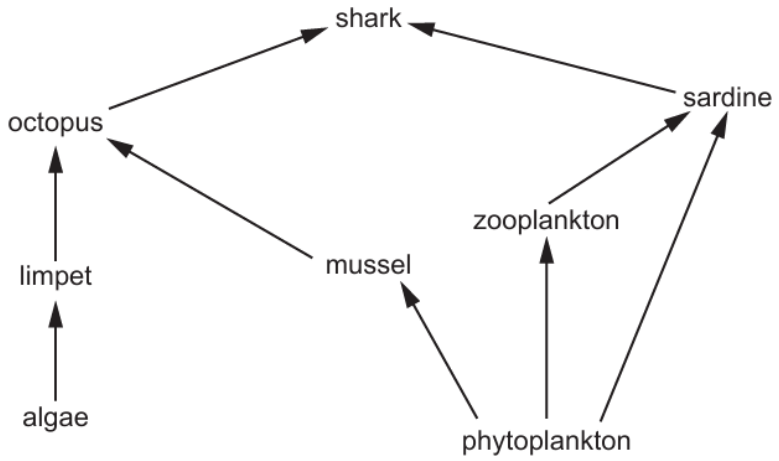

Fig. 4.1

(i) Place ticks (✓) in the boxes to show the correct descriptions for the organisms shown in Fig. 4.1.

organism	carnivore	herbivore	producer	tertiary consumer
algae				
zooplankton				
shark				

[3]

(ii) Construct **one** food chain from Fig. 4.1 that contains **four** organisms including the **octopus**.

..... [2]

(iii) Identify **one** organism in Fig. 4.1 that feeds at the second **and** third trophic levels.

..... [1]

(b) State the name of the type of organism that gets its energy from dead organic material.

..... [1]

(c) State the principal source of energy in most biological systems.

..... [1]

(d) Outline ways humans can directly impact food webs.

.....

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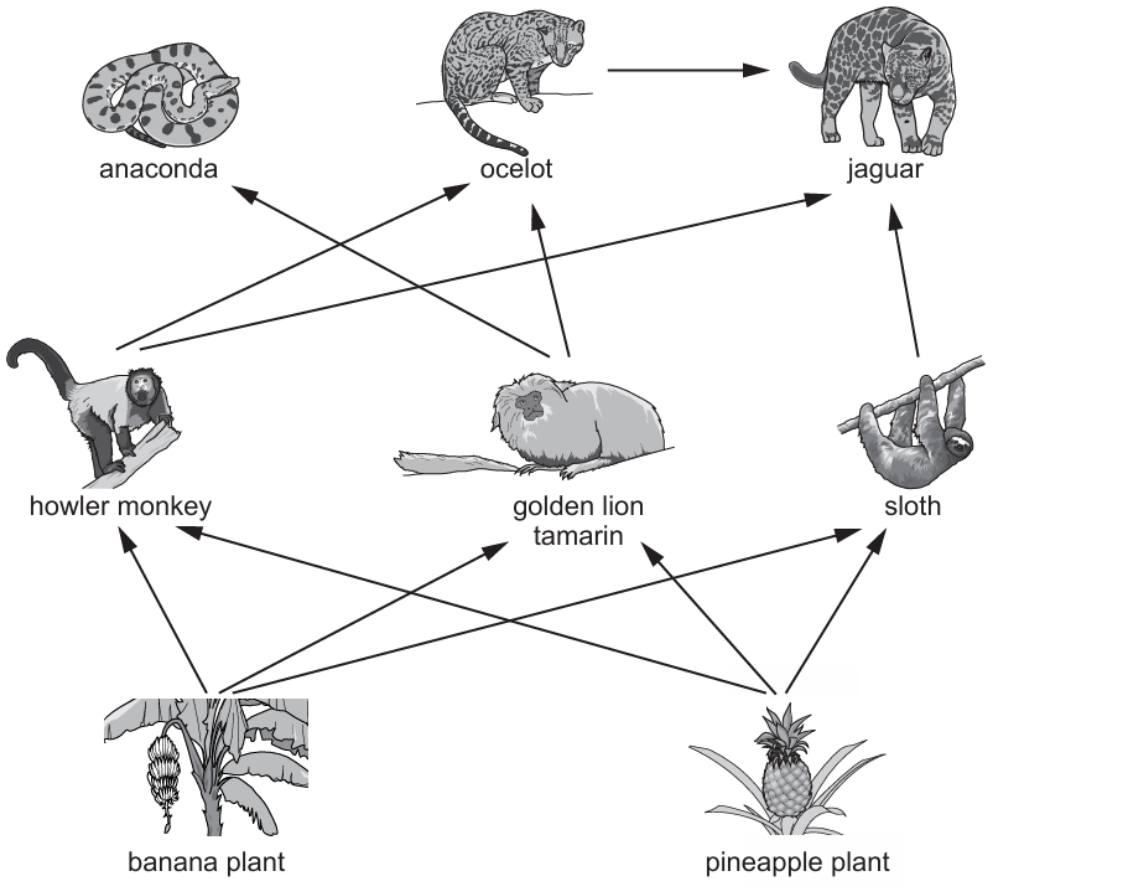
..... [3]

[Total: 11]

5 Fig. 4.1 is a drawing of a rainforest food web.



not to scale

Fig. 4.1

(a) (i) State the name of **one** producer shown in Fig. 4.1.

..... [1]

(ii) State the name of **one** herbivore shown in Fig. 4.1.

..... [1]

(iii) State the number of carnivore species shown in Fig. 4.1.

..... [1]

(iv) Use the information in Fig. 4.1 to complete the food chain that contains the howler monkey and three other organisms.

..... → howler monkey → ..... → .....

[2]

(v) Overhunting of golden lion tamarins caused the population of anacondas and sloths to change.

Explain why the populations of:
- anacondas decrease
- sloths increase.

anacondas .....

.....

.....

sloths .....

.....

.....
[2]

(vi) State the principal source of energy for food webs.

..... [1]

(b) Conservationists counted the number of organisms in each feeding level for one of the food chains in a rainforest.

The data were used to draw a pyramid of numbers. Table 4.1 shows the data.

Table 4.1

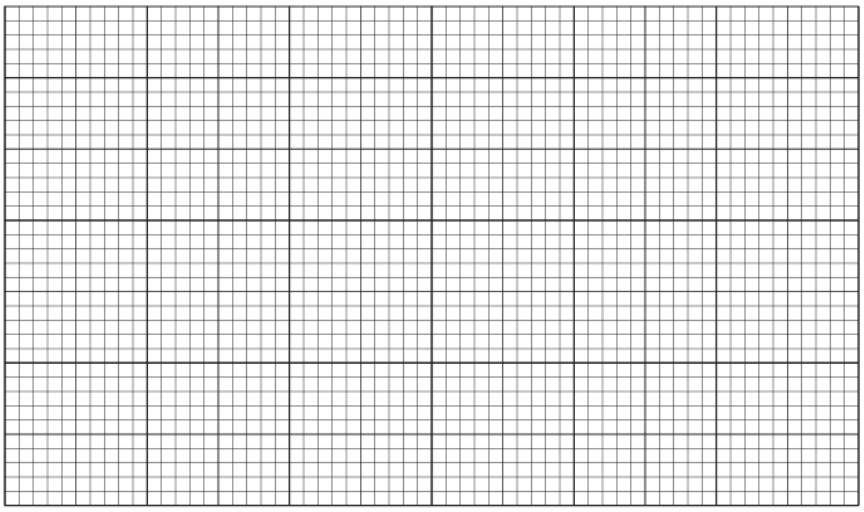
feeding level	number of organisms	width of the bar in the pyramid of numbers / cm
producer	4	0.4
primary consumer	100	10.0
secondary consumer	26	
tertiary consumer	8	0.8

(i) Complete Table 4.1 by calculating the width of the bar for the secondary consumer feeding level.

..... cm [1]

(ii) Using the information in Table 4.1 and your answer to **4(b)(i)**, draw a pyramid of numbers on the grid. Each small square on the grid is 0.2 cm wide.

Label each bar with the feeding level.



[4]

6 Fig. 5.1 shows a food web.

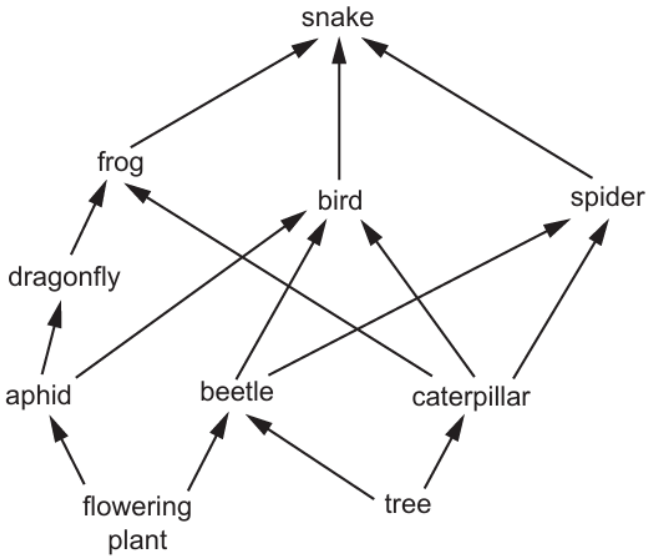


Fig. 5.1

(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]

(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]

(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.

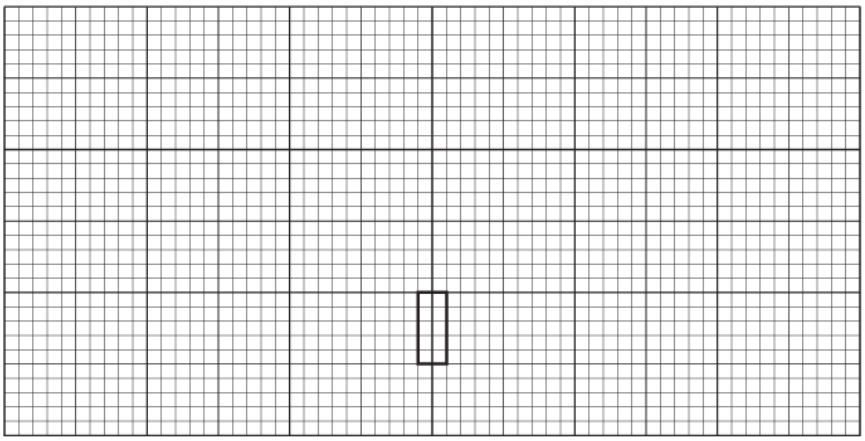
Table 5.2

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]

7 **(a)** Rabbits are herbivores.

Define the term *herbivore*.

.....

..... [2]

8 **(a)** **(i)** The sentences in the box describe the feeding relationships between four organisms.

Hawks obtain their energy from blackbirds.
A fig tree carries out photosynthesis.
Blackbirds are secondary consumers.
Caterpillars are herbivores.

Use the information in the sentences to write a food chain containing these four organisms.

Do **not** draw pictures of the organisms.

[3]

(ii) State the principal source of energy for this food chain.

..... [1]

(iii) State the type of organism that gains its energy from dead organic material.

..... [1]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

9 **(d)** Phytoplankton are photosynthetic organisms.

Describe the importance of phytoplankton in the food web of lake ecosystems.

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.....

.....

..... [3]

10 Fig. 6.1 is a photograph of a coral reef.

Fig. 6.1

(b) Fig. 6.2 is part of a food web for a coral reef ecosystem which is similar to the one shown in Fig. 6.1.

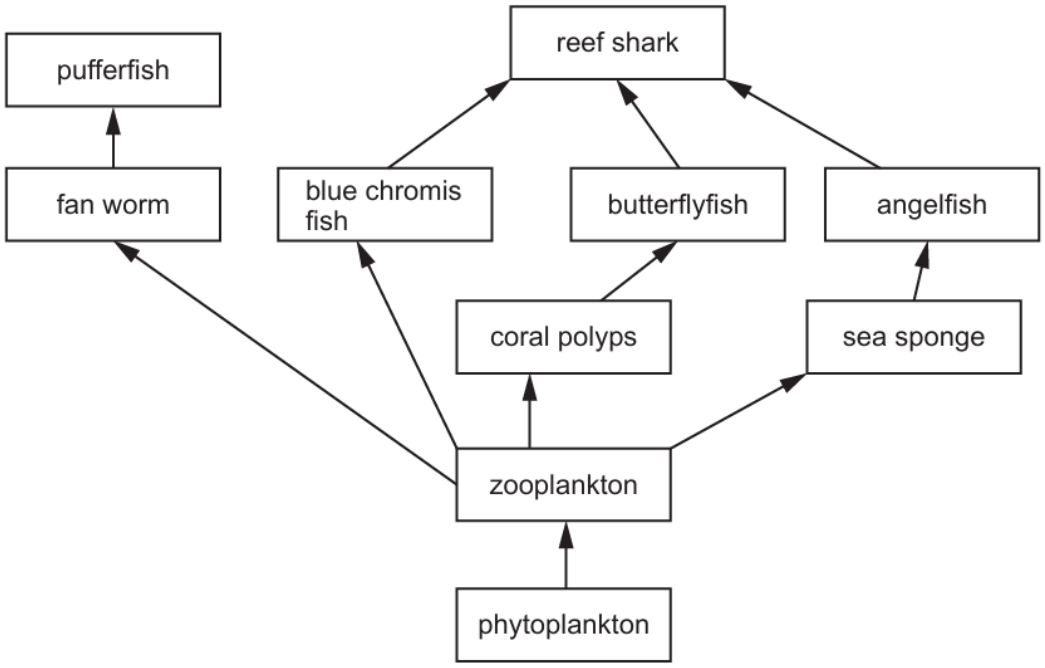

Fig. 6.2

(i) State the number of secondary consumers shown in Fig. 6.2.

..... [1]

(ii) State the name of a species that feeds at more than one trophic level in Fig. 6.2.

..... [1]

(iii) State the number of different organisms in the shortest food chain in Fig. 6.2.

..... [1]

(iv) State the evidence from the food web in Fig. 6.2, that phytoplankton are producers.

..... [1]

(v) It is rare for there to be more than five trophic levels in an ecosystem.

Explain what limits the number of trophic levels in food webs. **(extended only)**

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..... [3]

11 **(d)** Fig. 5.4 is a food web for some of the microorganisms in a sewage treatment works.

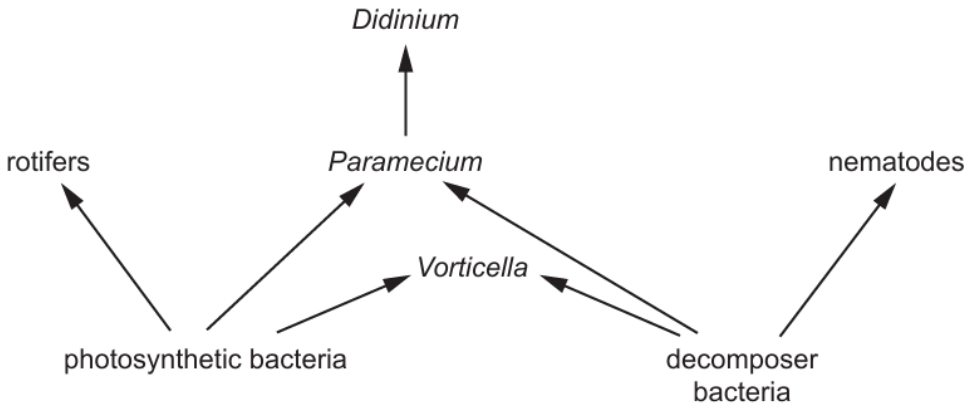

Fig. 5.4

(i) Construct **one** food chain with three trophic levels that use energy derived from the breakdown of sewage. Do **not** draw the organisms.

..... [1]

12 Fig. 3.1 is a food web for a forested area in Central America.

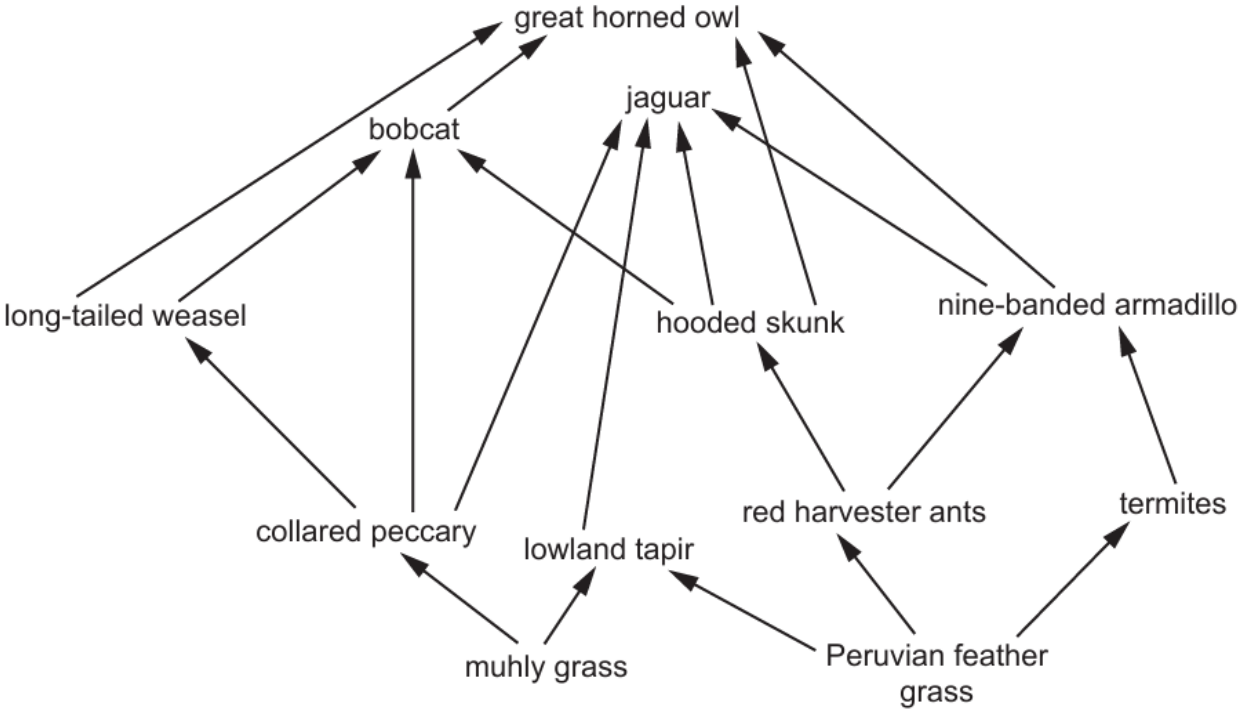

Fig. 3.1

(a) Complete Table 3.1 using information from Fig. 3.1.

Table 3.1

trophic level	description	example from Fig. 3.1
herbivore		
producer		
	feeds on tertiary consumers	
secondary consumer		

[4]

(b) Fig. 3.2 shows the flow of energy through a food chain. The size of each box represents the energy available in each trophic level, numbered 1, 2, 3 and 4.

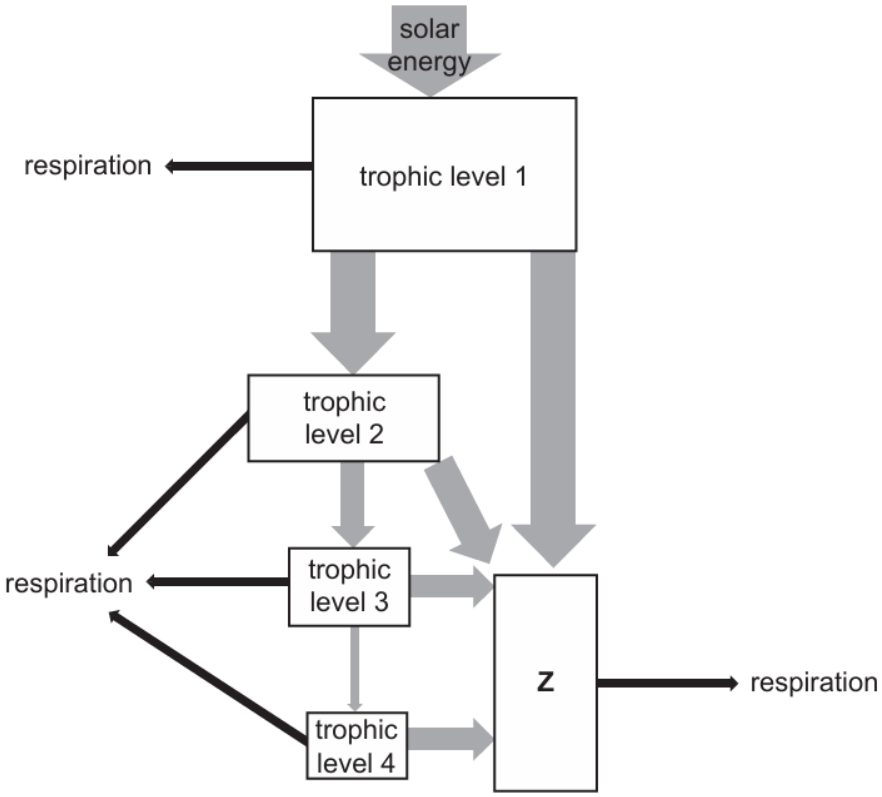

Fig. 3.2

(i) State the term given to the group of organisms represented by **Z** in Fig. 3.2.

..... [1]

(ii) Explain, with reference to Fig. 3.2, why food chains usually have fewer than five trophic levels. **(extended only)**

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..... [4]

13 **(c)** A scientist studied communities in different parts of a desert and estimated the biomass of the organisms in each area.

He divided the organisms into four groups according to their roles in the food web as shown in Table 2.1.

Detritivores are animals that eat dead organisms or parts of organisms.

Table 2.1

groups of organisms in the food web	biomass / g per m^2
producers	480
herbivores	220
detritivores	120
carnivores	40

Some of these results are shown as a pyramid of biomass in Fig. 2.2.

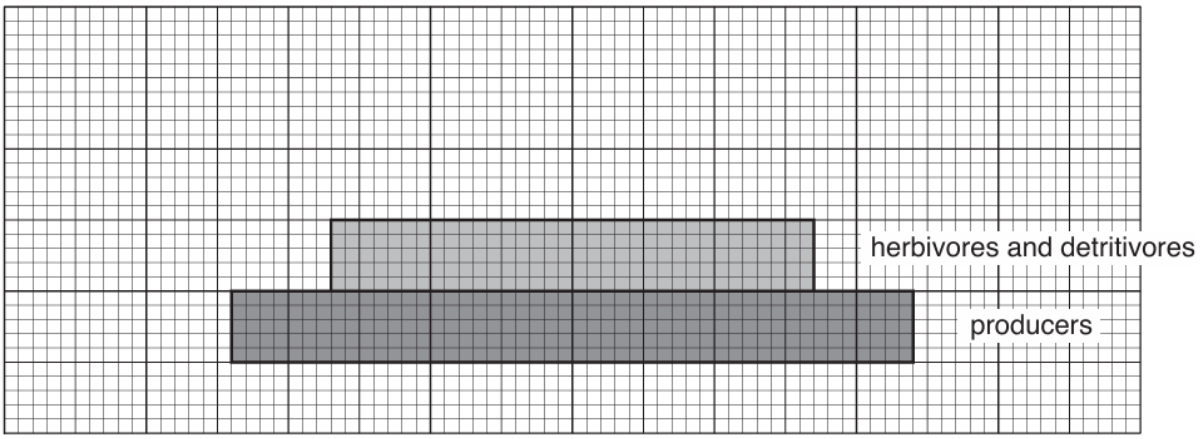

Fig. 2.2

(i) Use the information in Table 2.1 to complete the pyramid of biomass in Fig. 2.2. [2]

(ii) The scientist observed the detritivores and decided to include them with herbivores in this pyramid of biomass.

Suggest what the scientist discovered about the detritivores that made him make this decision.

.....

.....

.....[1]

(iii) Explain why there are rarely more than four or five trophic levels in ecosystems. **(extended only)**

.....

.....

.....

.....

.....[2]

(iv) Explain the advantages of presenting information about food webs as a pyramid of biomass and **not** as a pyramid of numbers.

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.....[3]

14 Fig. 1.1 shows a pyramid of biomass and part of the carbon cycle.

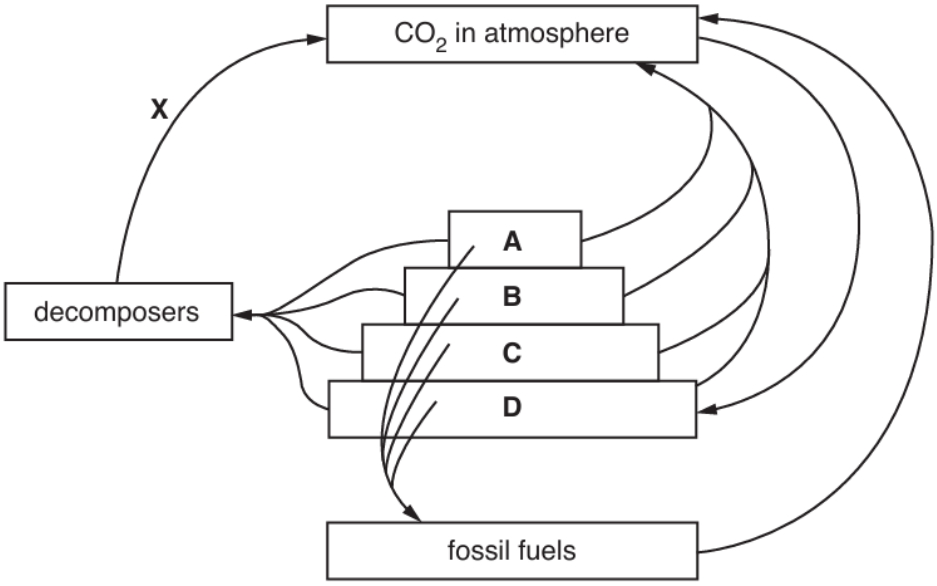

Fig. 1.1

(a) (i) State the principal source of energy required for trophic level **D** of the pyramid of biomass in Fig. 1.1.

.....[1]

(ii) State the letter that represents the primary consumers in Fig. 1.1.

..... [1]

(iii) State how carbon is transferred from producers to primary consumers.

.....[1]

(iv) Explain why trophic level **A** is smaller than trophic level **B** in the pyramid of biomass in Fig. 1.1.

.....

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.....

.....

.....

.....[3]

15 Wetlands are important ecosystems. Researchers studied the feeding relationships between the organisms in an area of wetland on the coast of Texas.

Fig. 1.1 shows part of the food web that they studied.

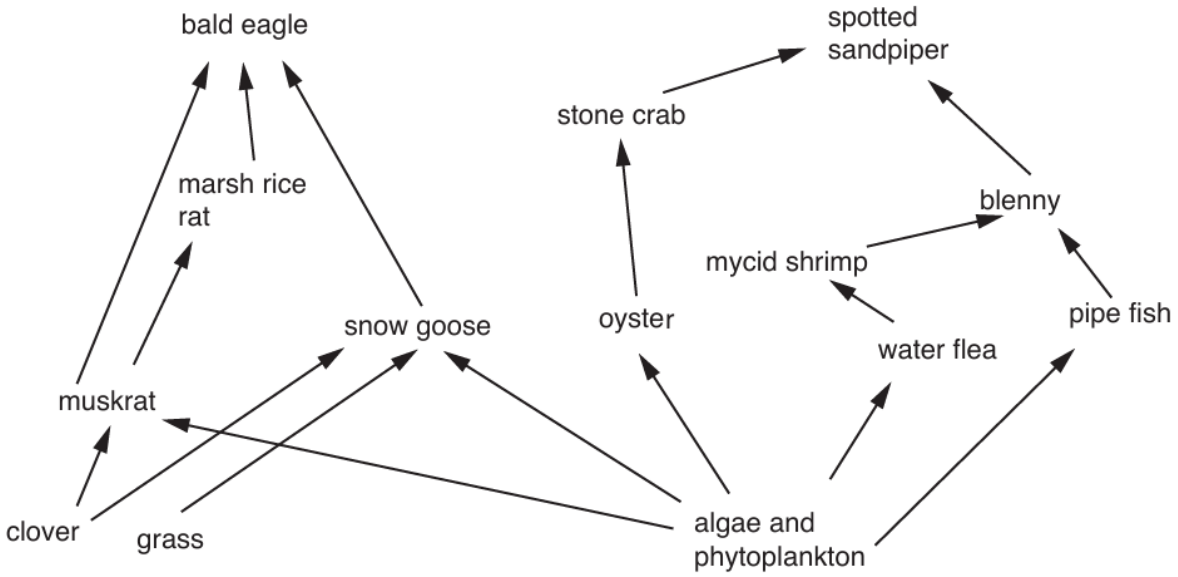

Fig. 1.1

(a) Complete Table 1.1 by giving the name of **one** organism from the food web in Fig. 1.1 for each row.

Table 1.1

	name of organism from Fig. 1.1
producer	
secondary consumer	
an animal that feeds at two trophic levels	

[3]