1 Fig. 2.1 is an electron micrograph showing the bacteria, *Vibrio cholerae*.

Fig. 2.1

(a) **(i)** Bacteria are prokaryotes.

State **two** distinguishing features of all prokaryotes.

1 .....

2 .....

[2]

(ii) The bacteria shown in Fig. 2.1 each have a flagellum.

Suggest the function of the flagellum in bacteria.

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.....

..... [1]

(b) *V. cholerae* is the pathogen that causes cholera. Vaccination is used to control the spread of cholera during an outbreak.

Explain how vaccination can control the spread of diseases.

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..... [4]

(c) Many years ago scientists discovered that *V. cholerae* secretes a toxin. Fig. 2.2 shows the results of an experiment to measure the flow of chloride ions out of human cells with and without the toxin.

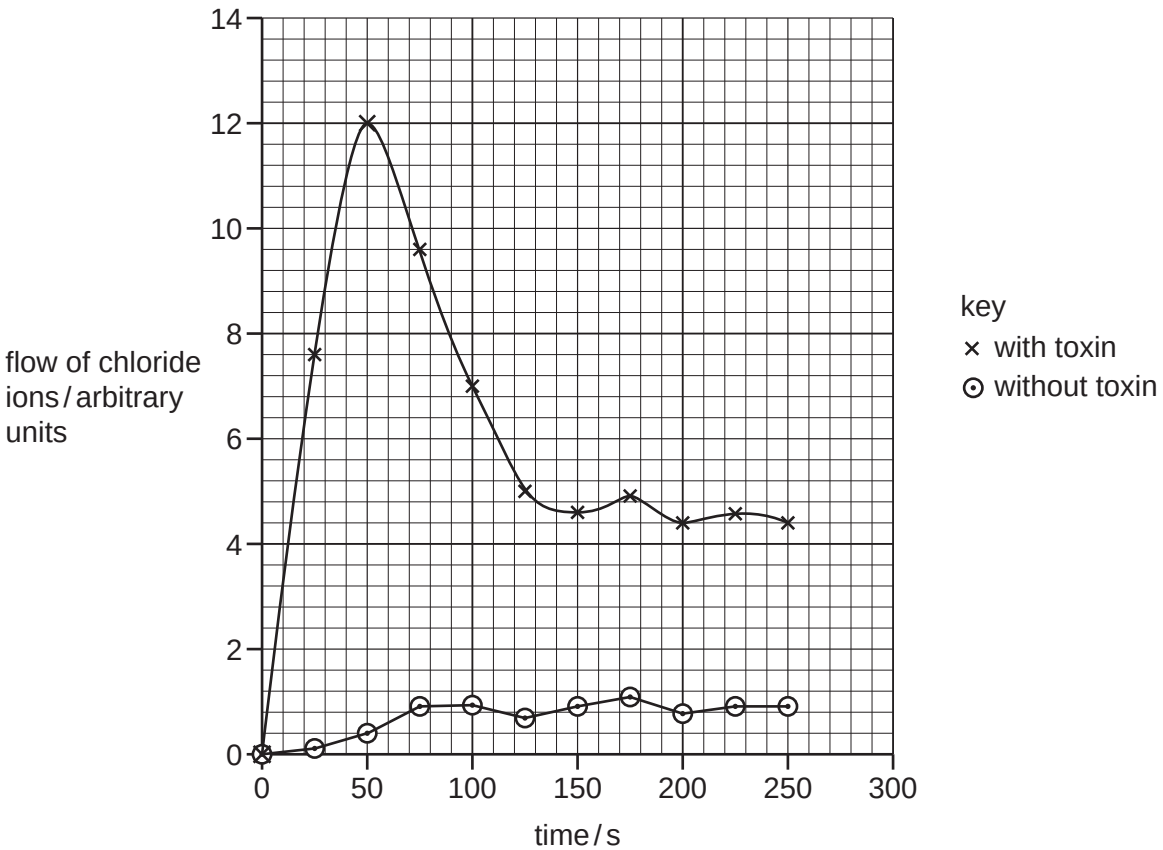

Fig. 2.2

(i) Calculate the difference in flow of chloride ions between the cells with the toxin and the cells without the toxin at 50 seconds.

Show your working and state the units in your answer.

..... [2]

(ii) Use the data in Fig. 2.2 to describe the effect of the toxin on the flow of chloride ions out of the cells.

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..... [3]

(iii) Chloride ions cannot move out of cells by simple diffusion.

Suggest **and** describe how chloride ions could move out of cells.

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..... [3]

(d) The loss of chloride ions from cells causes diarrhoea and dehydration in patients with cholera.

(i) State which organ in the alimentary canal is affected by the cholera toxin.

..... [1]

(ii) Describe the treatment for cholera.

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..... [2]

[Total: 18]

2 **(a)** Fig. 1.1 shows five species of mollusc.

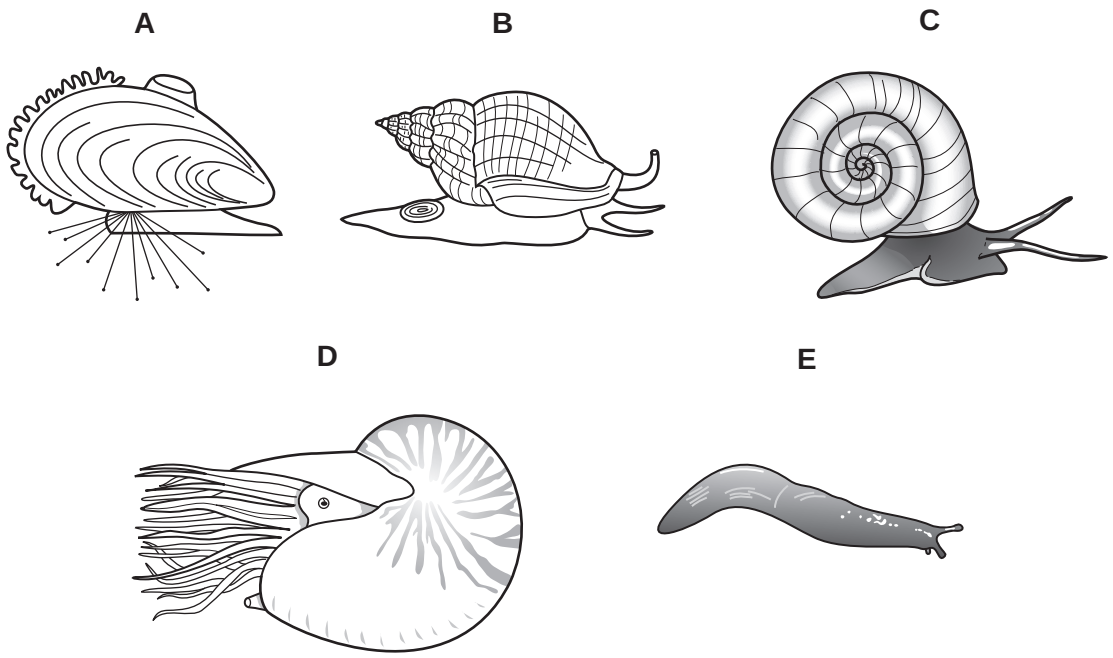


Fig. 1.1

Use the key to identify each species. Write the letter of each species (**A** to **E**) in the correct box beside the key.

Key

1 (a)	body is completely or partly covered in a shell	go to 2	
(b)	body is not completely covered or partly covered in a shell	*Limax flavus*	
2 (a)	shell is attached to rocks by thin threads	*Mytilus edulis*	
(b)	shell is not attached to rocks by thin threads	go to 3	
3 (a)	shell is a spire that comes to a point	*Buccinum undatum*	
(b)	shell is not a spire that comes to a point	go to 4	
4 (a)	animal has tentacles	*Nautilus pompilius*	
(b)	animal has 2 tentacles	*Planorbis planorbis*	

[3]

(b) State **two** features that are shown by all molluscs.

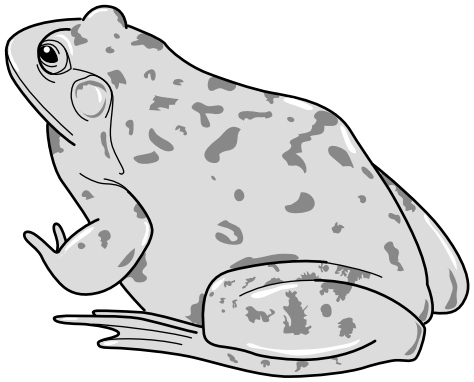
1 .....

2 .....

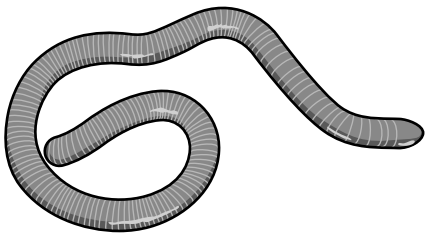
[2]

[Total: 5]

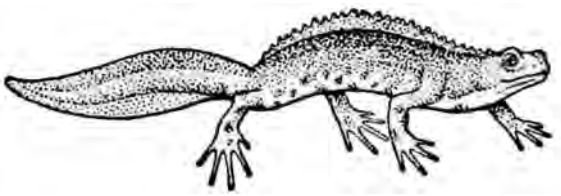
3 Fig. 1.1 shows seven different species of amphibian.



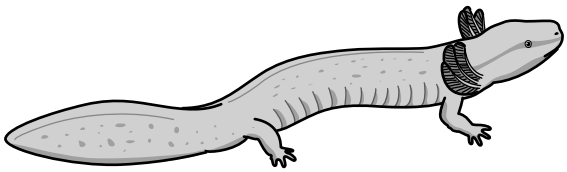
A



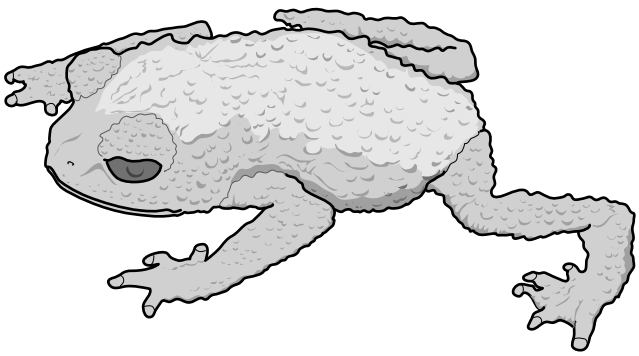
B



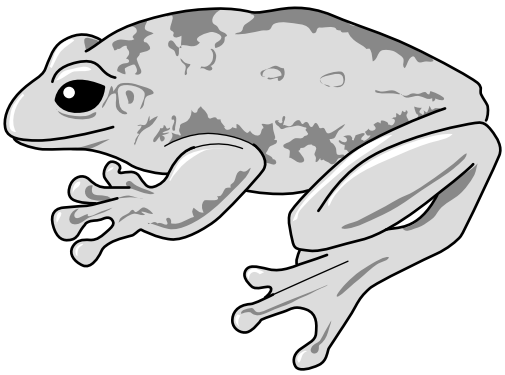
C



D



E



F

G

not drawn to scale

Fig. 1.1

(a) Use the key to identify each species. Write the letter of each species (**A** to **G**) in the correct box beside the key. One has been done for you.

Key

1 (a)	long, narrow body, with or without legs	go to 2	
(b)	body not long and narrow, back legs are larger than the front legs	go to 5	
2 (a)	body without legs	*Gymnopis multiplicata*	**B**
(b)	body with legs which are all of the same size	go to 3	
3 (a)	raised crest along the back of the body	*Triturus cristatus*	
(b)	no crest along the back of the body	go to 4	
4 (a)	gills present	*Necturus maculosus*	
(b)	no gills present	*Ambystoma tigrinum*	
5 (a)	skin is smooth	go to 6	
(b)	skin is not smooth	*Oreophrynella quelchii*	
6 (a)	digits end in swellings	*Polypedates leucomystax*	
(b)	digits do not end in round swellings	*Rana temporaria*	

[3]

(b) Many amphibian species throughout the world are endangered.

Suggest **three** reasons why many amphibian species are endangered.

1 .....

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2 .....

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3 .....

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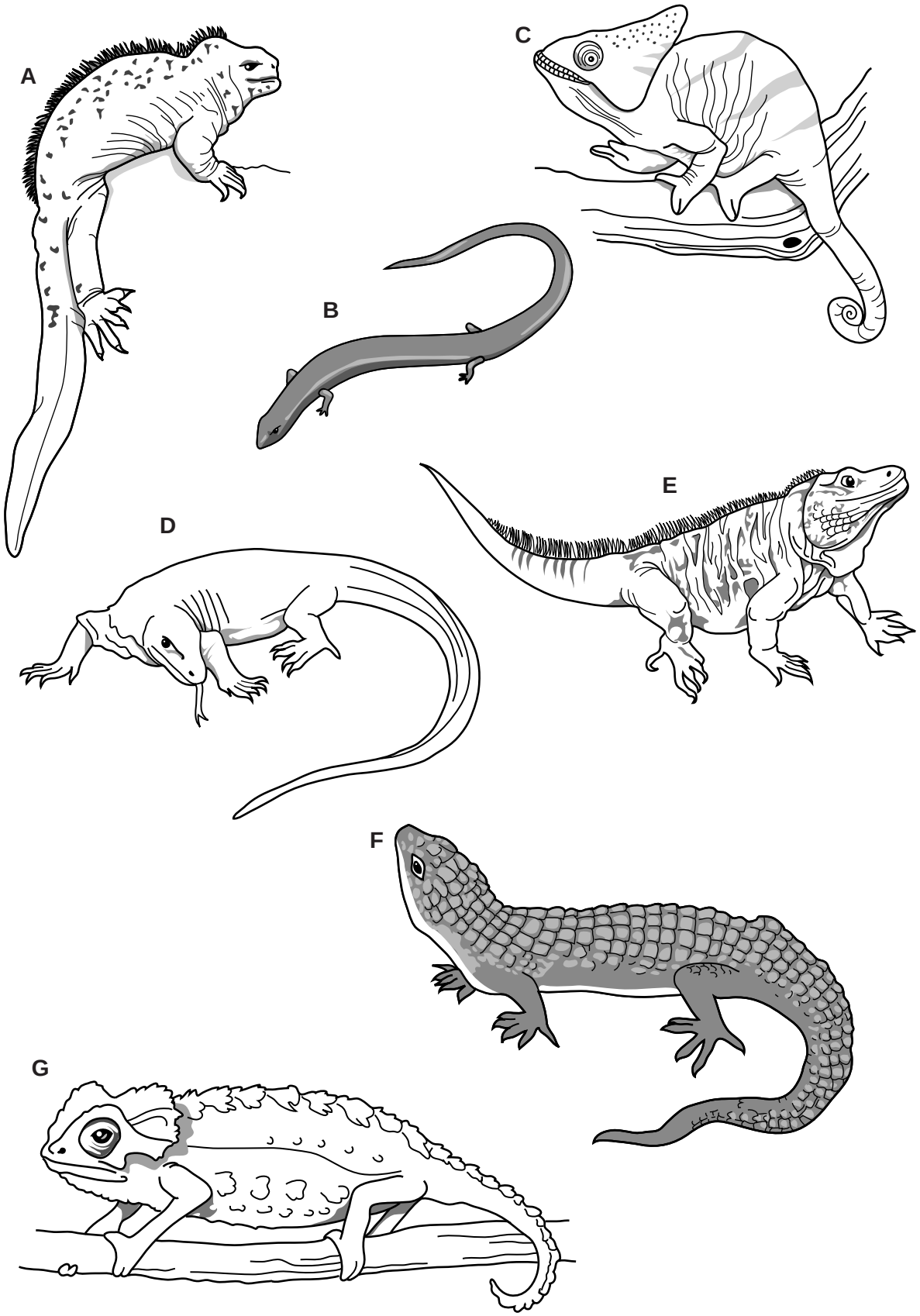
[3]

[Total: 6]

4 Fig. 1.1 shows seven lizards that are at risk of becoming extinct.



(a) (i) Name the vertebrate group that contains lizards.

.....[1]

(ii) Use the key to identify each species. Write the letter of each species (**A** to **G**) in the correct box beside the key. One has been done for you.

key

1	(a)	feet with three toes	go to 2	
	(b)	feet with five toes	go to 3	
2	(a)	has a collar or crest on head	go to 4	
	(b)	has no collar or crest on head	*Chalcides minutus*	
3	(a)	spikes along back	go to 5	
	(b)	no spikes along back	go to 6	
4	(a)	ridges extend along back and tail	*Brookesia perarmata*	
	(b)	no ridges along back or tail	*Calumma parsonii*	
5	(a)	blunt, rounded head	*Amblyrhynchus cristatus*	
	(b)	elongated head	*Cyclura lewisi*	
6	(a)	large raised scales on skin	*Abronia graminea*	
	(b)	scales on skin are not large or raised	*Varanus komodoensis*	**D**

[3]

(b) The effect of humans on the environment has caused the populations of the lizard species in Fig. 1.1 to decrease.

Explain why conserving lizards is important.

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.....[3]

(c) Zookeepers report that isolated female Komodo dragons, *Varanus komodoensis*, have produced offspring asexually. This is very unusual in vertebrates.

(i) State **two** disadvantages of asexual reproduction.

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.....[2]

(ii) State **two** disadvantages of sexual reproduction.

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.....[2]

(d) Sexual reproduction requires meiosis to occur.

(i) Define the term *meiosis*.

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.....[2]

(ii) Explain the significance of meiosis to the survival of endangered species of lizards.

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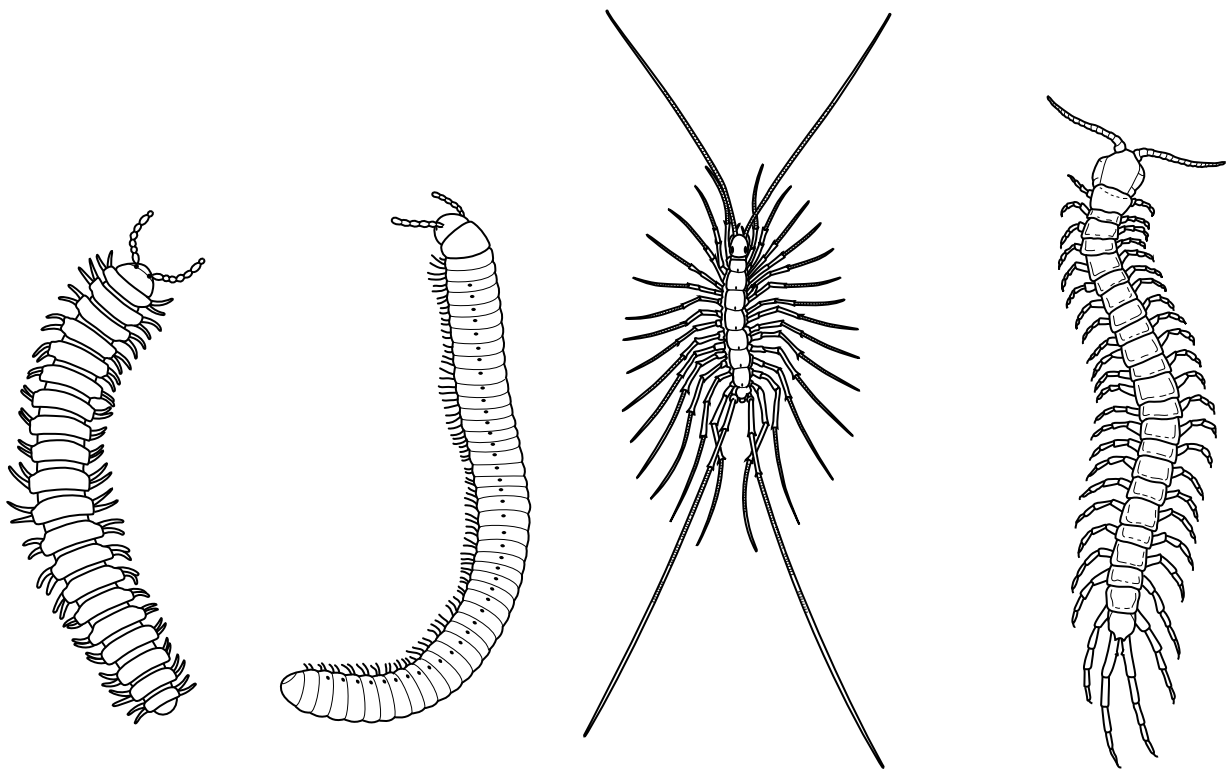
.....[3]

[Total: 16]

5 Myriapods are a group of arthropods that are commonly found in soil habitats in many parts of the world. Many myriapods are very small and not easy to identify.

Fig. 6.1 shows four species of myriapod, not drawn to the same scale.



Polydesmus denticulatus | *Cylindroiulus punctatus* | *Scutigera coleoptrata* | *Scolopocryptops sexspinosus*

Fig. 6.1

(a) State **three** features of **all** myriapods that are visible in Fig. 6.1.

1 .....

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2 .....

.....

3 .....

..... [3]

(b) Describe **three** features of myriapods that could be used to make a dichotomous key to distinguish between the four species in Fig. 6.1.

1 .....

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2 .....

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3 .....

..... [3]

(c) Mitochondria are cell structures that contain a small quantity of DNA.

Scientists are sequencing the DNA of one particular gene in mitochondria to help identify different species of many animals including myriapods. The sequences that they find are called 'barcodes'.

(i) State the part of the cell that contains most of the DNA.

..... [1]

(ii) Suggest how DNA barcoding might be useful in the conservation of animals, such as myriapods.

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..... [2]

(iii) State the function of DNA in cells.

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..... [2]

(d) A student found the following information about the feeding relationships between some organisms in a soil habitat.

Dead organic matter, such as leaves, provides food for bacteria and soil fungi.

Earthworms eat dead leaves.

Many millipedes feed on dead plant matter and also on soil fungi.

Nematodes feed on bacteria and are eaten by springtails.

Centipedes are predators that feed on earthworms, millipedes and springtails.

(i) Draw a food web to show the feeding relationships described above.

[4]

(ii) Describe the roles of the soil organisms in the **carbon** cycle.

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..... [2]

[Total: 17]