Chapter 1

Characteristics and classification of living organisms

Characteristics of living organisms

KEY WORDS

excretion: the removal of the waste products of metabolism and substances in excess of requirements

growth: a permanent increase in size and dry mass

metabolic reactions: chemical reactions that take place in living organisms

movement: an action by an organism or part of an organism causing a change of position or place

nutrition: taking in materials for energy, growth and development

organism: a living thing

reproduction: the processes that make more of the same kind of organism

respiration: the chemical reactions in cells that break down nutrient molecules and release energy for metabolism

sensitivity: the ability to detect and respond to changes in the internal or external environment

Exercise 1.1

IN THIS EXERCISE YOU WILL:

practise naming and describing the characteristics of living things.

Focus

1 Draw lines to match each term with its description.

Term	Description
nutrition	making more of the same kind of organism
respiration	removing waste products of metabolism
growth	a permanent increase in size and dry mass
excretion	taking in materials for energy, growth and development
reproduction	chemical reactions that release energy from nutrient molecules

Practice

2 Figure 1.1 shows a plant, growing towards the light. Inside its leaves, photosynthesis is taking place. Photosynthesis uses carbon dioxide to make glucose, and releases oxygen.

Add labels to Figure 1.1. Your labels should include short descriptions stating how the plant is showing these characteristics of living things:

- reproduction
- growth
- sensitivity
- excretion

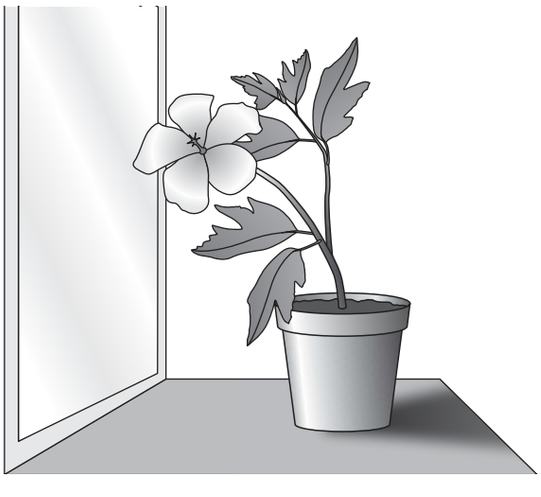

Figure 1.1: A plant growing towards the light.

Challenge

3 Imagine that someone from another planet is visiting Earth. They see aeroplanes and birds moving through the sky.

Explain to the visitor why birds are alive and aeroplanes are not alive, even though they seem to share some of the characteristics of living things.

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The biological classification system

KEY WORDS

binomial system: a system of naming species that is internationally agreed, in which the scientific name is made up of two parts showing the genus and the species

fertile: able to reproduce

genus: a group of species that share similar features and a common ancestor

species: a group of organisms that can reproduce to produce fertile offspring

Exercise 1.2

IN THIS EXERCISE YOU WILL:

- check that you know what a binomial is
- practise finding evidence in a short, written passage
- think about advantages of using the binomial system.

Focus

4 Complete the sentences, using words from the list.

binomial **biological** **complete** **fertile** **genus** **group** **healthy**
living **population** **reproduce** **species**

An organism is a …….. thing. A …….. is a group of living organisms that can …….. with each other to produce …….. offspring.

Each species of organism has a two-word name. This system of naming is called the …….. system. The first of the two words in the name tells us the …….. that the species belongs to.

Practice

5 Tigers, *Panthera tigris*, and lions, *Panthera leo*, sometimes mate with each other if they are kept together in a zoo. The offspring are called ligers. Ligers are perfectly healthy, but are unable to reproduce.

Use this information to write down:

a *one* piece of evidence that lions and tigers are closely related

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b *two* pieces of evidence that lions and tigers belong to different species.

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Challenge

6 Many people dislike using binomials for species. They would prefer to just use English names. Explain why it is helpful to scientists to use the binomial system.

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Keys

KEY WORDS

dichotomous key: a way of identifying an organism, by working through pairs of statements that lead you to its name

Exercise 1.3: Focus

IN THIS EXERCISE YOU WILL:

practise using a key to identify four animals.

7 Figure 1.2 shows four vertebrates.

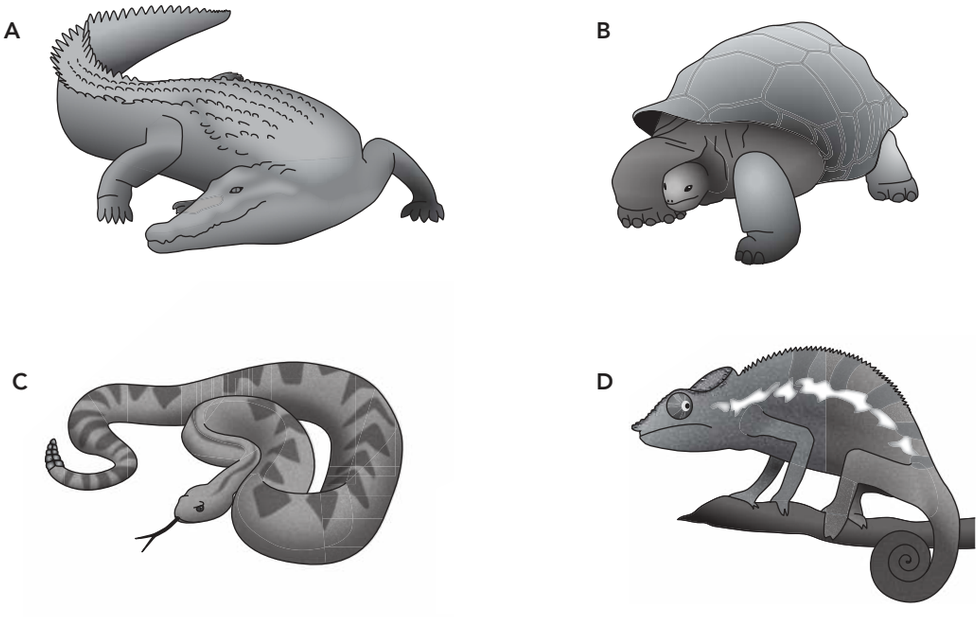

Figure 1.2: Four vertebrates.

Use the dichotomous key to identify each of these four animals.

List the sequence of statements that you worked through to find the name.

TIP

Remember to work on one animal at a time. Identify that one, then move on to the next.

1	a	shell present	*Geochelone elephantopus*
	b	shell absent	go to **2**
2	a	four legs	go to **3**
	b	no legs	*Ophiophagus hannah*
3	a	back and tail are covered with rough spikes	*Crocodylus niloticus*
	b	no spikes on tail	*Chamaeleo gracilis*

TIP

When writing binomials, underline them to show that they should be in italics. Remember that the genus name starts with a capital letter but the species name is all lowercase.

Animal A has been done for you.

A 1b, 2a, 3a – Crocodylus niloticus

B .....

C .....

D .....

Exercise 1.4: Practice

IN THIS EXERCISE YOU WILL:

practise writing a dichotomous key by completing one that has already been started.

8 Figure 1.3 shows a spider, locust, centipede and crab.

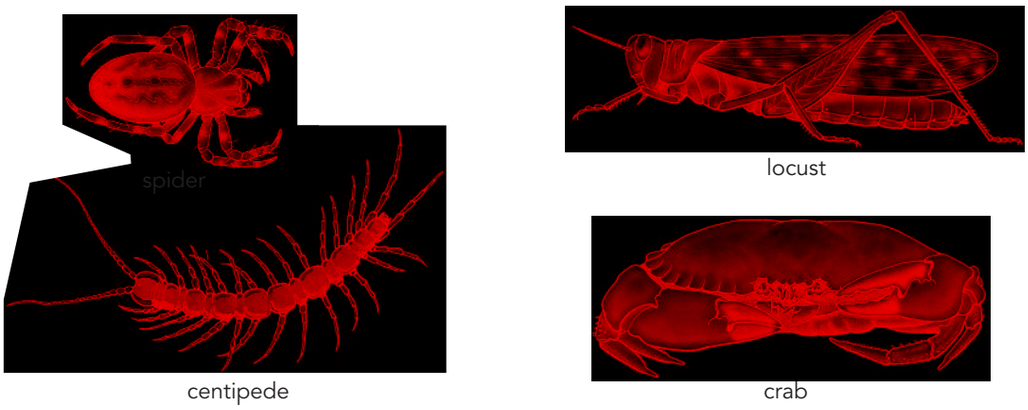

Figure 1.3: Spider, locust, centipede and crab.

Here is the start of a key to help someone who does not know anything about these animals to identify them. Complete the key by writing more pairs of statements.

Then try your key out on a friend.

1 a has antennae ..... go to **2**

b does not have antennae ..... spider

2 a has three pairs of legs .....

b .....

3 a .....

b .....

Exercise 1.5: Challenge

IN THIS EXERCISE YOU WILL:

write your own dichotomous key.

9 Figure 1.4 shows photographs of four species of fish.

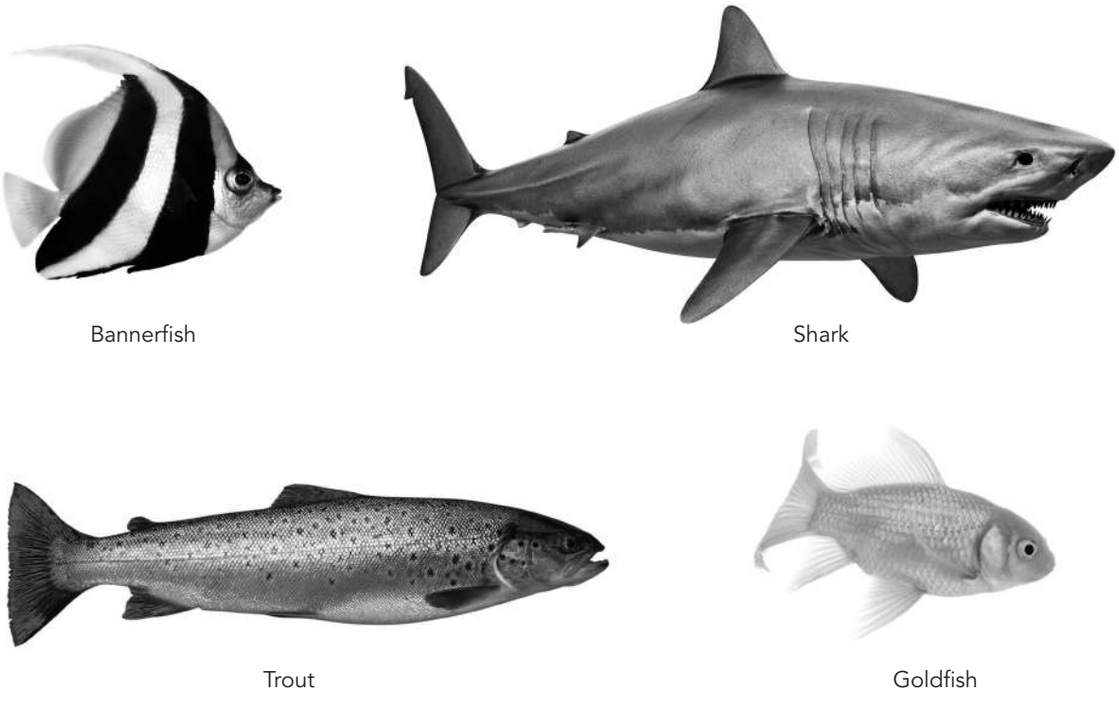

Figure 1.4: Four species of fish.

Write a dichotomous key to enable someone to identify each of the four fish.

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SELF-ASSESSMENT

How confident do you feel about using and writing keys? Rate yourself for each of the points in the checklist using:

☺ if you did it really well

😐 if you made a good attempt at it and partly succeeded

☹ if you did not try to do it, or did not succeed

Checklist	Rating
I can use a dichotomous key to identify organisms.	
I can complete a key that has already been started.	
I can write my own key with no help.	

What will you do to improve your ability to write a good dichotomous key?

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Kingdoms

KEY WORDS

fungus: an organism whose cells have cell walls, but that does not photosynthesise

hyphae: microscopic threads, made of cells linked in a long line, that make up the body of a fungus

kingdom: one of the major groups into which all organisms are classified

spores: very small groups of cells surrounded by a protective wall, used in reproduction

Exercise 1.6

IN THIS EXERCISE YOU WILL:

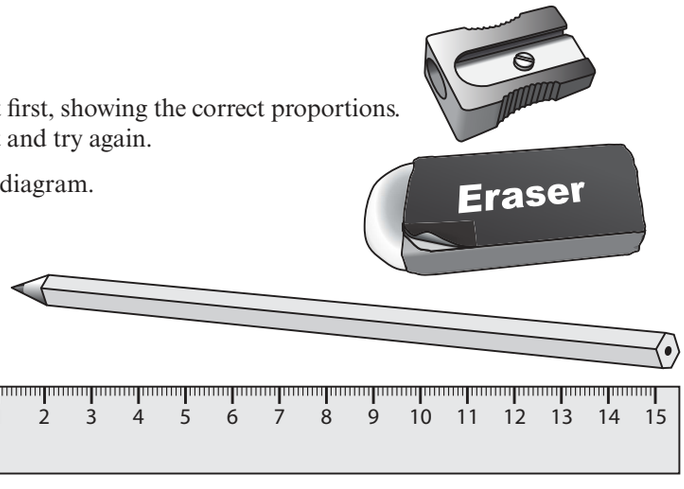
practise making the kind of drawing that is used in biology.

Biologists often need to describe clearly what they observe when studying organisms. One of the best ways to do this is to make a drawing.

A biological drawing needs to be simple, but clear. Sometimes, you need to label your drawing to indicate important features.

Here are some points to think about when you draw.

- Make good use of the space on your sheet of paper – your drawing should be large. However, do leave space around it so that you have room for labels.
- Always use a sharp HB pencil and have a good eraser with you.
- Keep all lines single and clear with no breaks.
- Do not use shading.
- Do not use colours.
- Take time to get the outline of your drawing correct first, showing the correct proportions. Do this lightly to start with, so that you can rub out and try again.

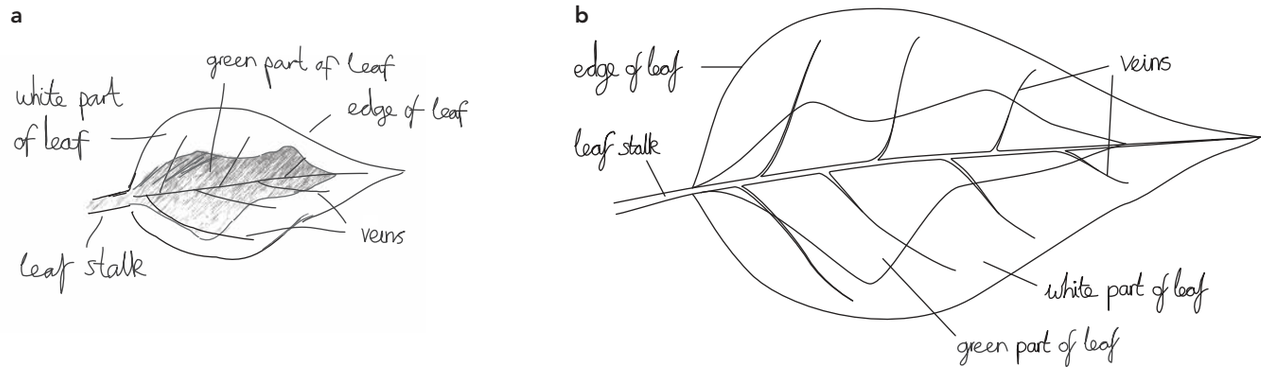


Here are some points to bear in mind when you label a diagram.

- Use a ruler to draw each label line.
- Make sure the end of the label line touches the structure being labelled.
- Write the labels horizontally.
- Keep the labels well away from the edges of your drawing.
- Do not let label lines cross one another.

Focus

Figure 1.5 shows two drawings of a leaf made by learners.



Figures 1.5 a and b: Two drawings of a leaf made by learners.

10 List *five* ways in which the second drawing (Figure 1.5b) is better than the first drawing (Figure 1.5a).

i .....

ii .....

iii .....

iv .....

v .....

Practice

11 Figure 1.6a is a photograph of an earthworm. A learner has begun to make a drawing of the earthworm (Figure 1.6b).

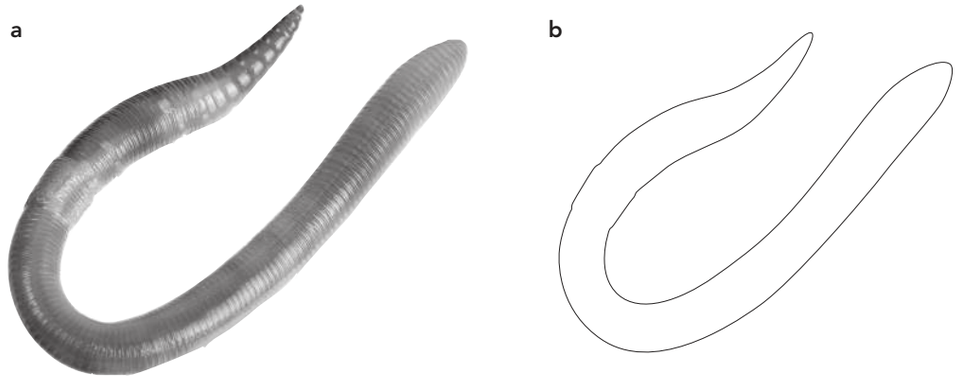


Figure 1.6 a: A photo of an earthworm. **b:** A drawing of the same earthworm.

a Complete the drawing of the earthworm. Add *two* labels to your drawing.