Science 5–6

Chapter 6 — Biological sciences

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Habitats, physical conditions, and what changes them

Words to know habitat · physical conditions · temperature · light · water · salinity · soil · shelter · survival · growth · sprout · hatch · nocturnal · mould · colony

Every living thing lives somewhere: a fish lives in a bay, a bee lives near flowers, a worm lives in soil. The place where a living thing lives is its **habitat**. In this section we describe habitats by their **physical conditions** — the non-living parts of the habitat, such as how hot or cold it is and how much water there is — and we see what happens to growth and survival when those conditions change, by nature or by people.

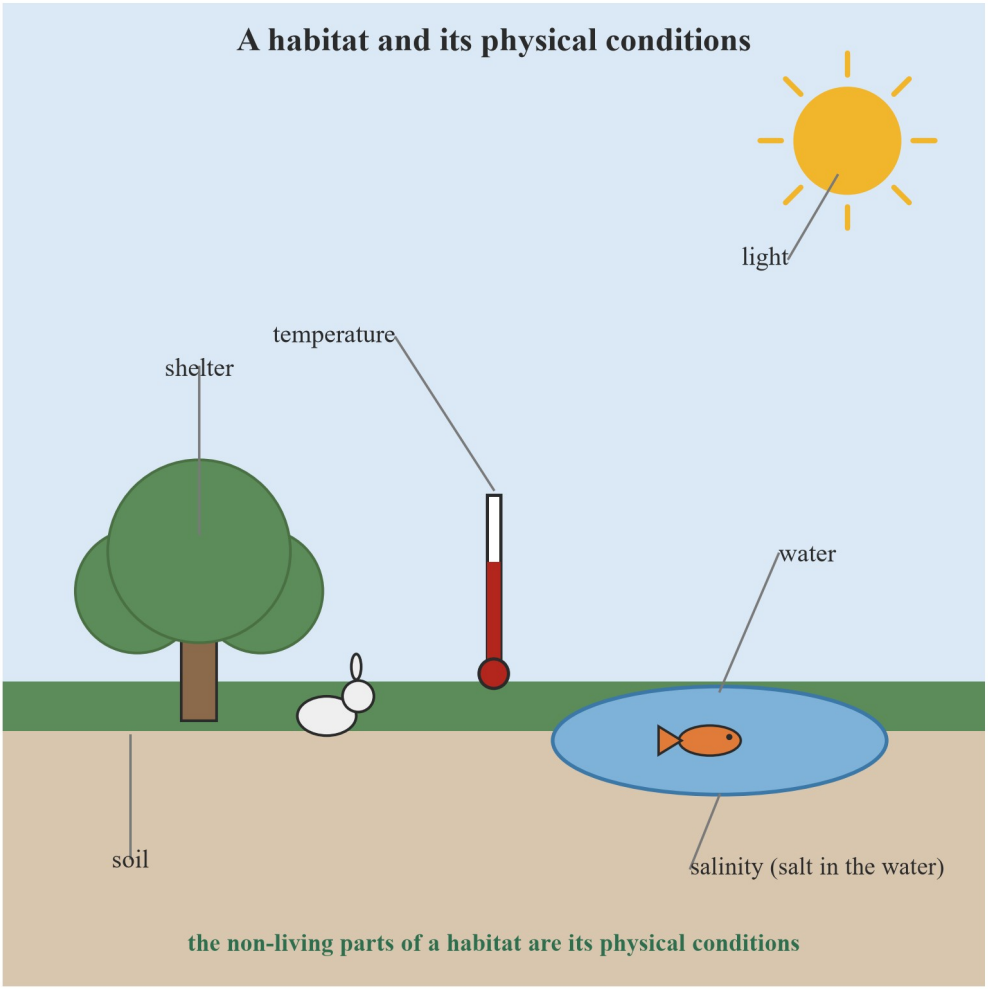
Theory

A habitat and its physical conditions

A **habitat** is the place where a living thing lives. The living things in a habitat need certain things from around them:

- **temperature** — how hot or cold it is;
- **light** — how much sunlight reaches the habitat;
- **water** — how much water there is, as rain, in soil or as a pond, creek or bay;
- **salinity** — how much salt is in the water;
- **soil** — what the ground is made of, and what is in it for plants;
- **shelter** — places where animals can hide, rest or stay safe.

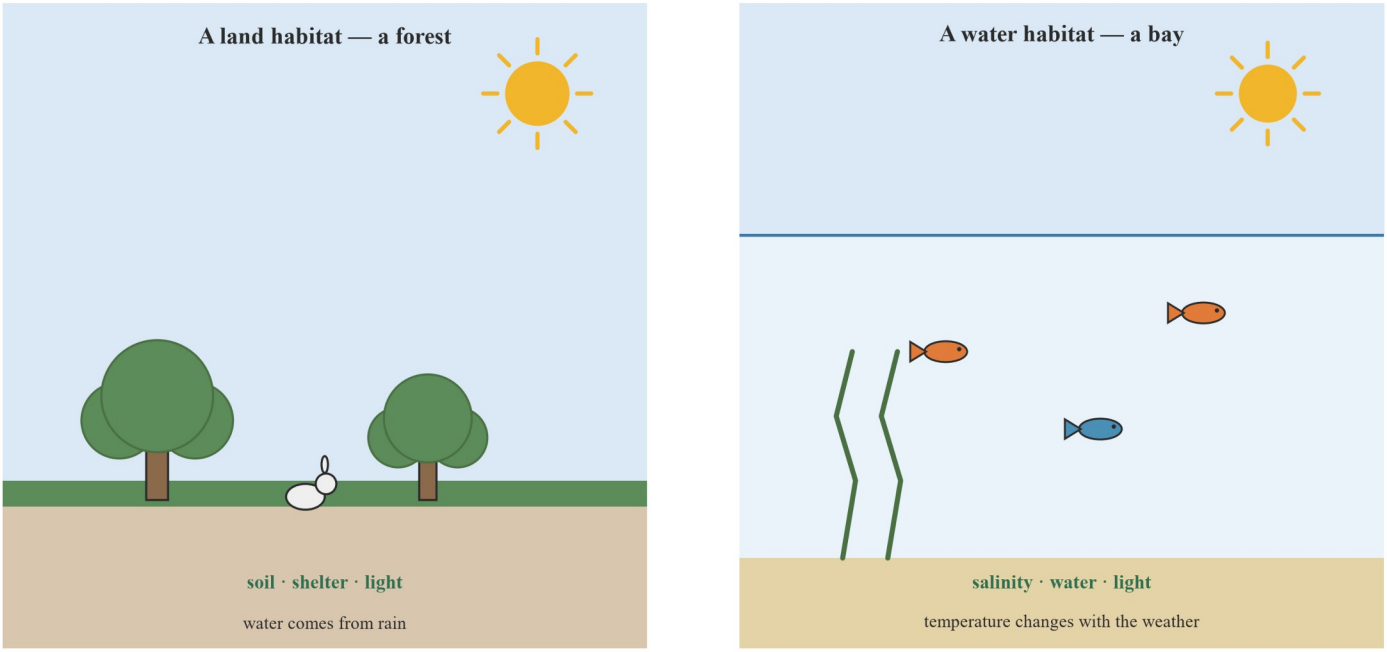
These non-living parts of a habitat are its **physical conditions**. A habitat can be described by its physical conditions, just as a person can be described by their height and their hair.



A habitat scene with its physical conditions labelled: sunlight for light, a thermometer for temperature, a pond for water, a tree giving shelter, soil below the grass, and a note that salinity is the salt in the water.

Conditions on land and in water

Land habitats and water habitats have different mixes of conditions.



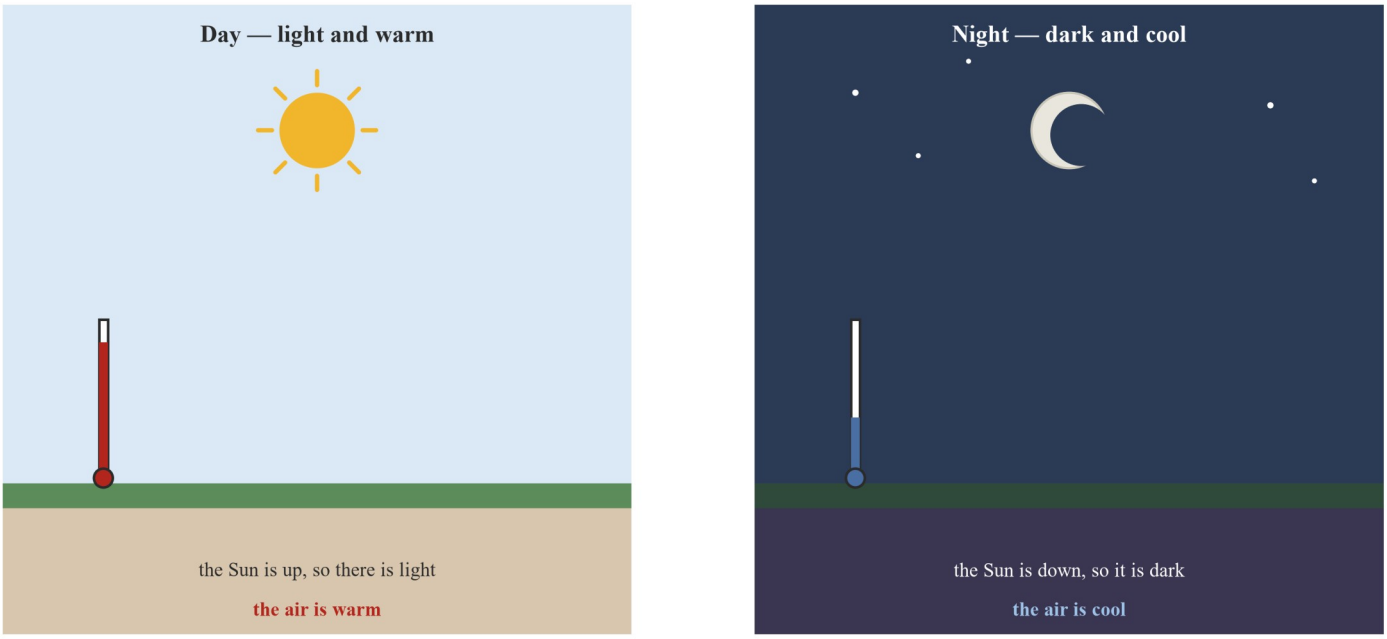
Two panels: a land habitat, a forest with soil, shelter and light, where water comes from rain; and a water habitat, a bay with salinity, water and light, where temperature changes with the weather.

- In a **land habitat** — a forest such as the Wombat State Forest in Victoria — plants root in the **soil**, animals find **shelter** under trees and logs, **light** comes from the Sun, and **water** arrives as rain.
- In a **water habitat** — a bay such as Port Phillip Bay in Victoria — the water is salty, so **salinity** is a condition every living thing there must cope with. **Light** only reaches the top of the water, and the **temperature** changes with the weather and the season.

The living things in each habitat can live with the conditions found there. A freshwater fish could not live in a salty bay; a tree could not live under water.

Conditions change across a day and across a year

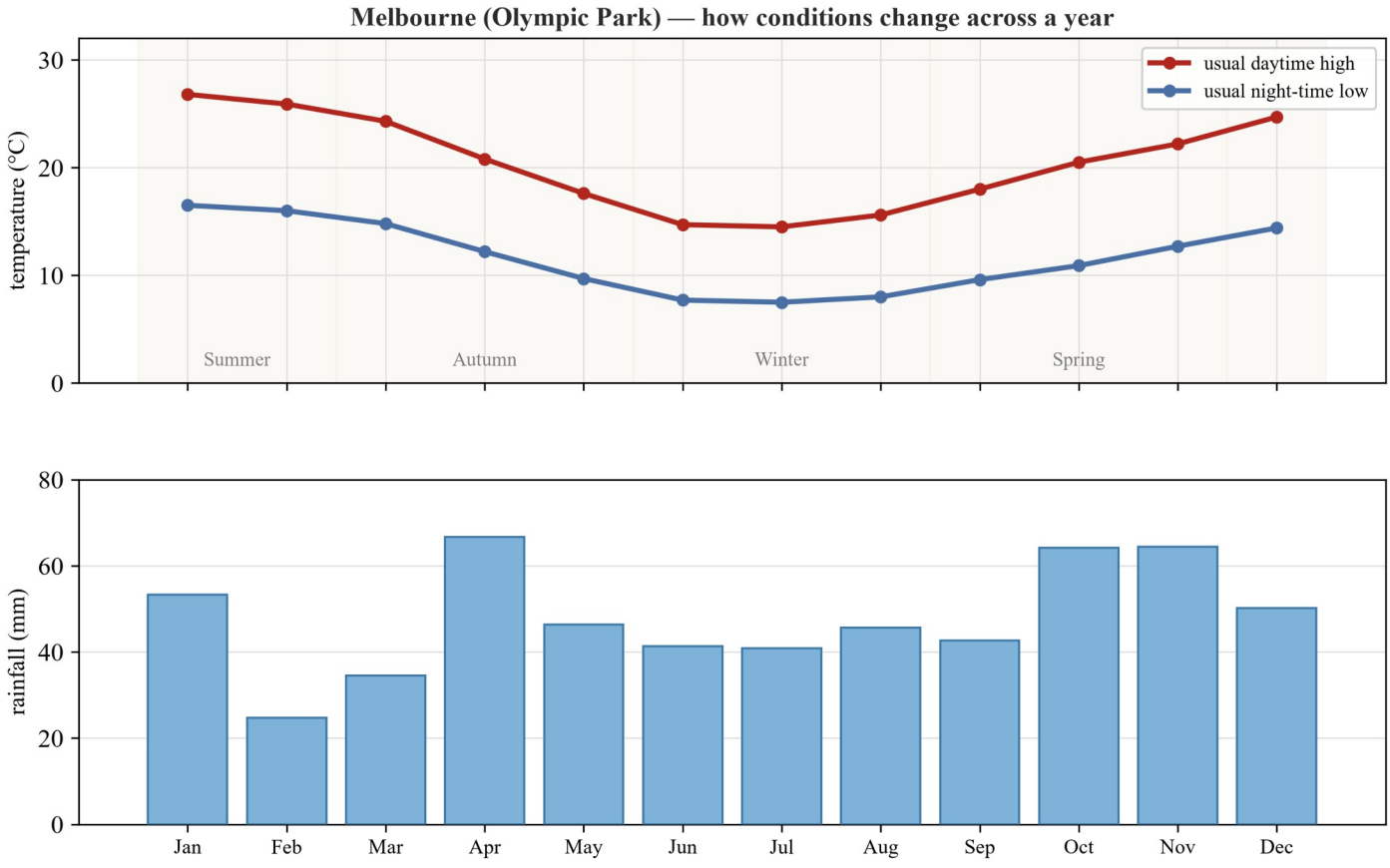
The physical conditions of a habitat are not fixed. They change across every day and across every year.



Two panels: day, with the Sun up so there is light and the air is warm, shown by a thermometer with a high reading; night, dark with the Moon and stars, the air cool, shown by a thermometer with a low reading.

Across a day, **light** and **temperature** change together: when the Sun is up there is light and the air is warm; when the Sun is down it is dark and the air is cool.

Across a year, the seasons change the conditions too. The graph below shows real measurements from Melbourne.



Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, monthly temperatures and rainfall, 2013–2026, bom.gov.au — retrieved 2026-08-21.

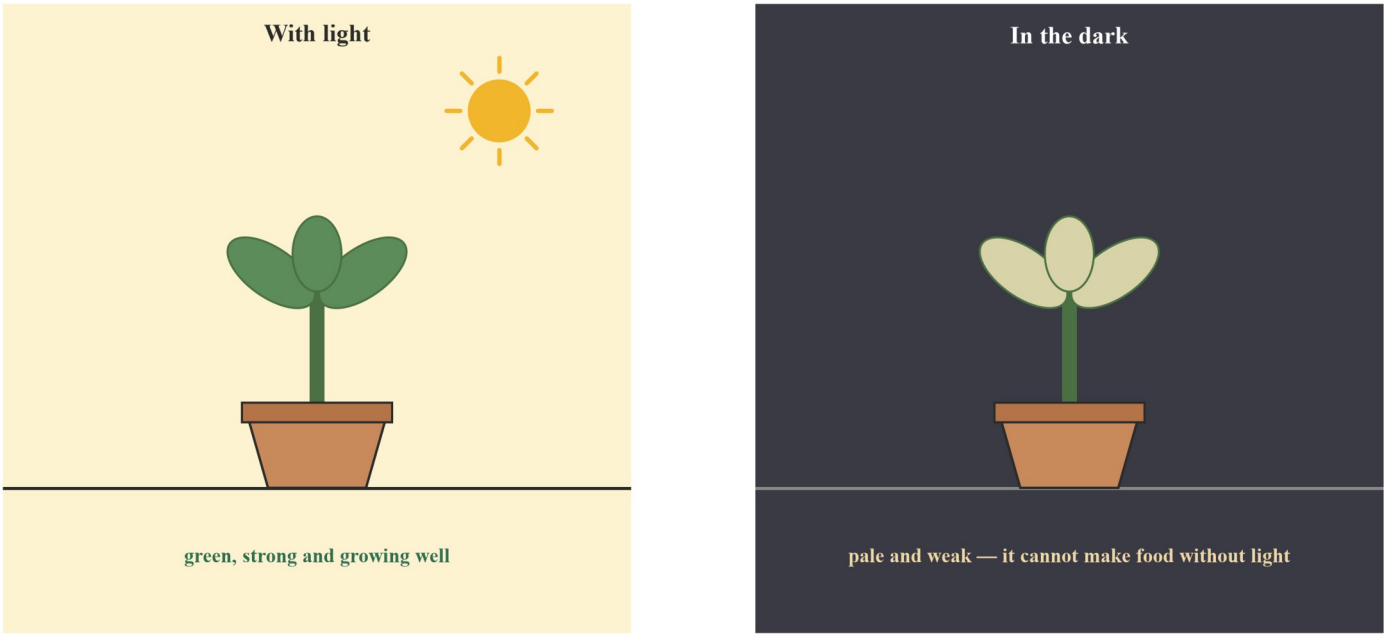
Two graphs of real Melbourne weather across a year: the usual daytime high and usual night-time low temperature in degrees Celsius for each month, highest in summer and lowest in winter; and the rainfall for each month, with rain in every month.

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, monthly temperatures and rainfall, 2013–2026, bom.gov.au — retrieved 2026-08-21.

Read the top graph like this: the usual daytime high is 26.8 °C in January, in the middle of summer, and only 14.5 °C in July, in the middle of winter. The bottom graph shows that rain falls in every month, with a little more in autumn (April) and spring (October and November). So the same habitat is warm and bright in summer and cool in winter — its physical conditions change across the year.

When conditions change, growth changes

A change in a physical condition changes how well plants grow.

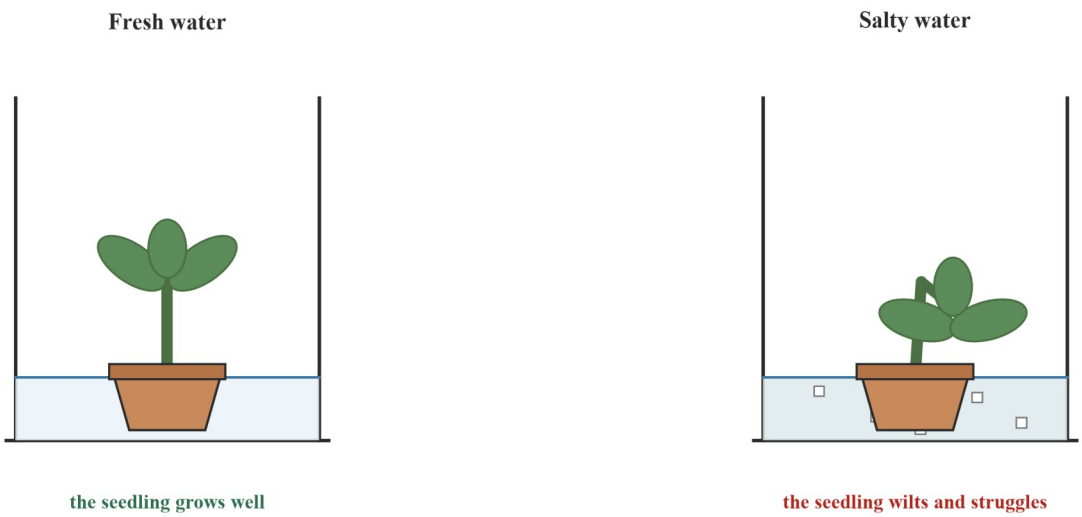


Two potted plants: one grown with light is green, strong and growing well; one grown in the dark is pale and weak because it cannot make food without light.

Plants make their own food in their leaves, and they need **light** to do it. A plant grown in the dark turns pale and weak; a plant grown in the light is green and strong.

Water matters just as much. A plant with too little water stops growing; a plant with the right amount grows tall. (Question 14 below shows a class investigation of this.)

Salinity matters too. Most plants grow badly if their water is salty.



Two seedlings in pots standing in trays of water: the one in fresh water grows well; the one in salty water, with salt grains drawn in the water, wilts and struggles.

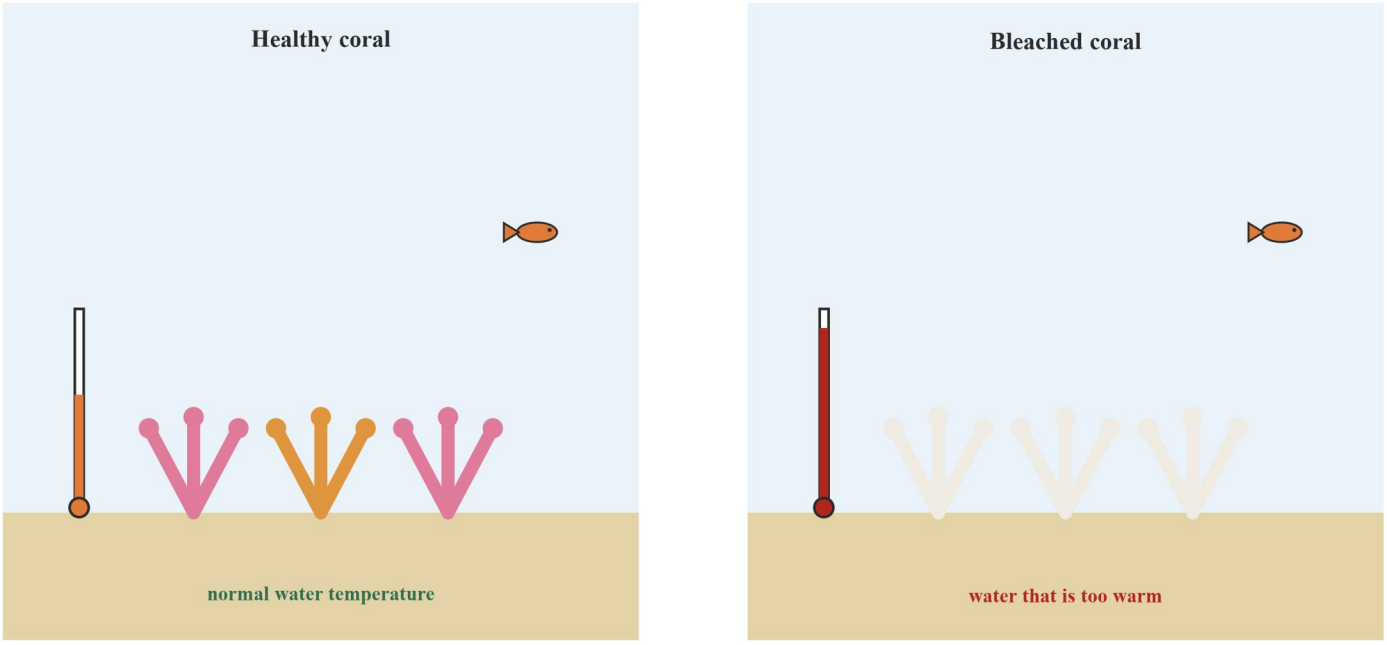
The seedling in fresh water grows well. The seedling in salty water wilts and struggles: the salt makes it hard for the plant to take in the water it needs. This is why farmers care about salt in their soil.

The **soil** itself is a condition. Sandy soil lets water run through quickly, so it dries out fast; clay soil holds water for longer. Different plants grow best in different soils.

Temperature is a condition for growth as well. A very cold night — a frost — can kill young plants, and warm spring days help them grow.

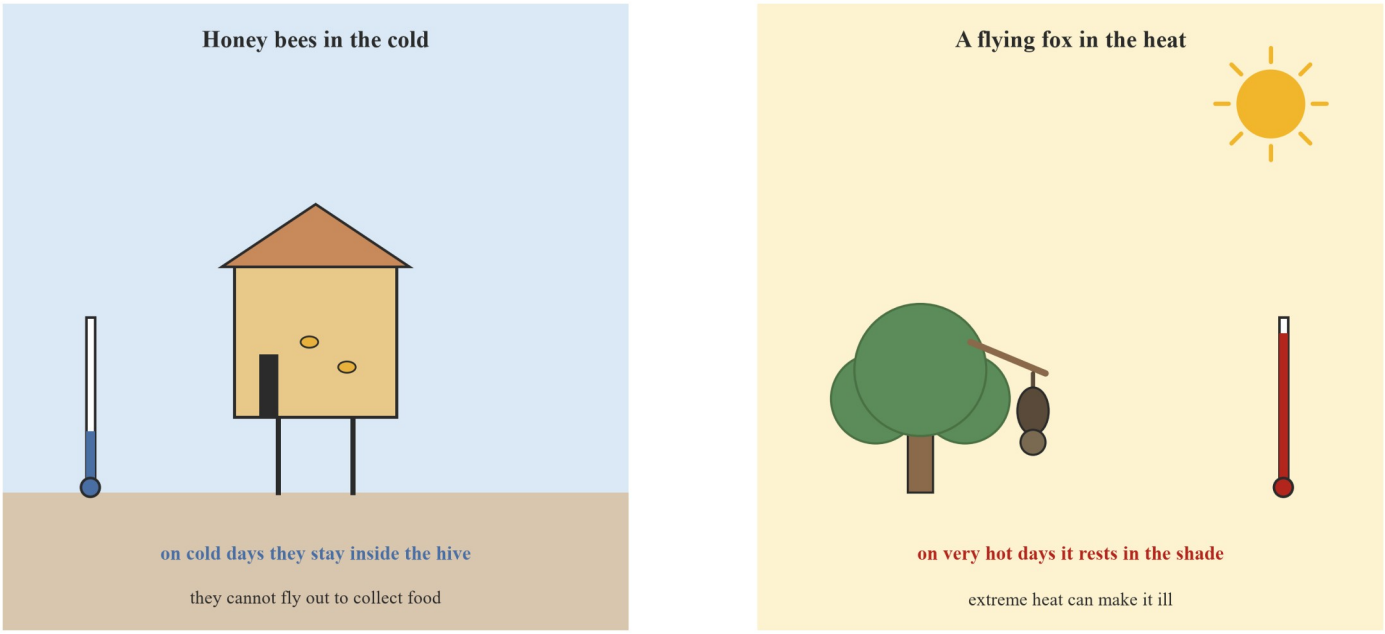
When conditions change, survival changes

A change in a condition does not only change growth. It can decide whether a living thing survives at all.



Two panels of coral on the sea floor with a thermometer: healthy coloured coral at a normal water temperature, and white bleached coral in water that is too warm.

Corals live in warm, shallow seas, such as the Great Barrier Reef off Queensland. Inside healthy coral are tiny living things that give the coral its colour and much of its food. When the water gets too warm, the coral loses them and turns white. This is called **bleaching**. A bleached coral has not died, but it has lost its food supply, so it can starve.



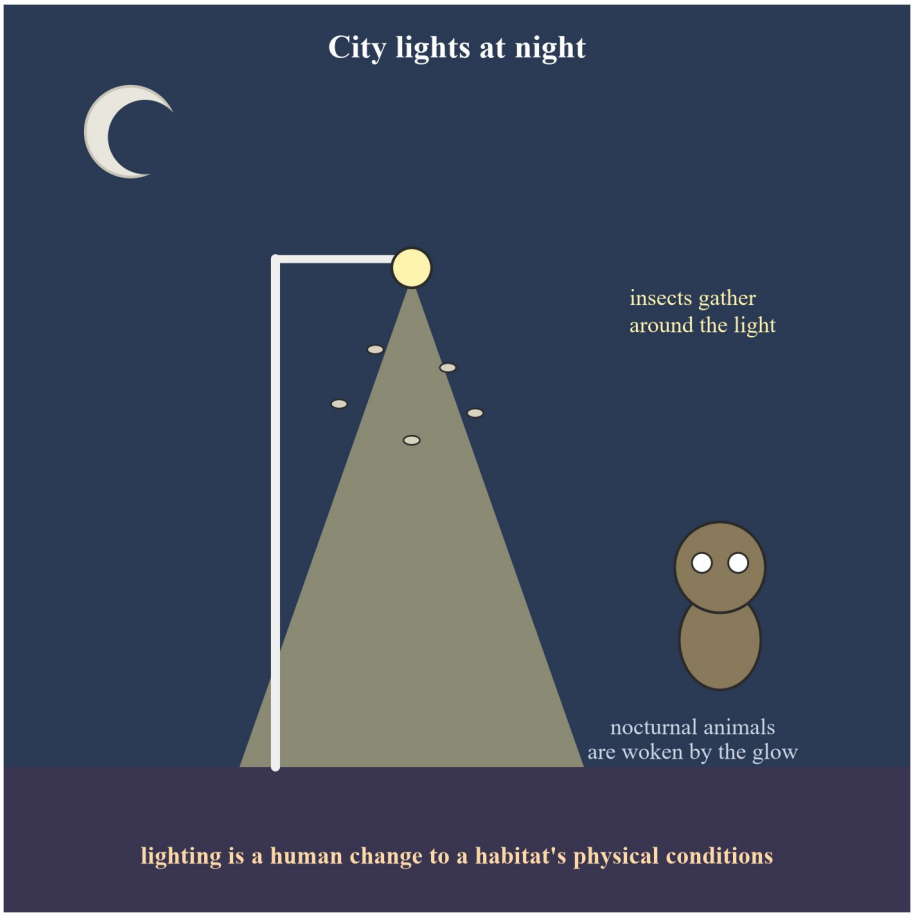
Two panels: honey bees staying inside their hive on cold days because they cannot fly out to collect food, with a low thermometer; and a flying fox hanging in the shade of a tree on a very hot day, with a high thermometer, because extreme heat can make it ill.

- **Honey bees** collect food from flowers. On cold days they cannot fly out; they stay inside the hive, huddle together in a ball and shiver to keep warm. A long cold spell means less food for the hive.
- The **grey-headed flying fox** lives in camps around Melbourne. On very hot days it rests in the shade to get through the heat. Extreme heat, such as a heatwave, can make flying foxes ill and can kill many of them.

In each case, one physical condition — the temperature — decides how well the living thing survives.

People change conditions too

Conditions change by nature, as above, and they also change because of what people do.



A street light at night in a city: insects gather around the light, and a nocturnal animal is woken by the glow; caption: lighting is a human change to a habitat's physical conditions.

Nocturnal animals are active at night. For them, darkness is part of their habitat. City street lights change that condition:

- insects gather around the lights and get tired or get eaten;
- nocturnal animals are woken by the glow, or become confused about when night is;
- birds that migrate at night, finding their way by the stars, can be pulled off their path by bright city lights.

Clearing land is another human change. When trees are cut down, the shelter and the shade go with them, the ground gets hotter and drier, and the soil can wash away. The physical conditions of the habitat have changed, so the living things that could survive there change too.

Conditions can gate a stage of life

Some stages of life only begin when the right condition is there.

Three panels: a seed starts to grow when it has water; an egg hatches only if it is kept at the right temperature; and a pond drying in the sun, so the animals that live there must move.

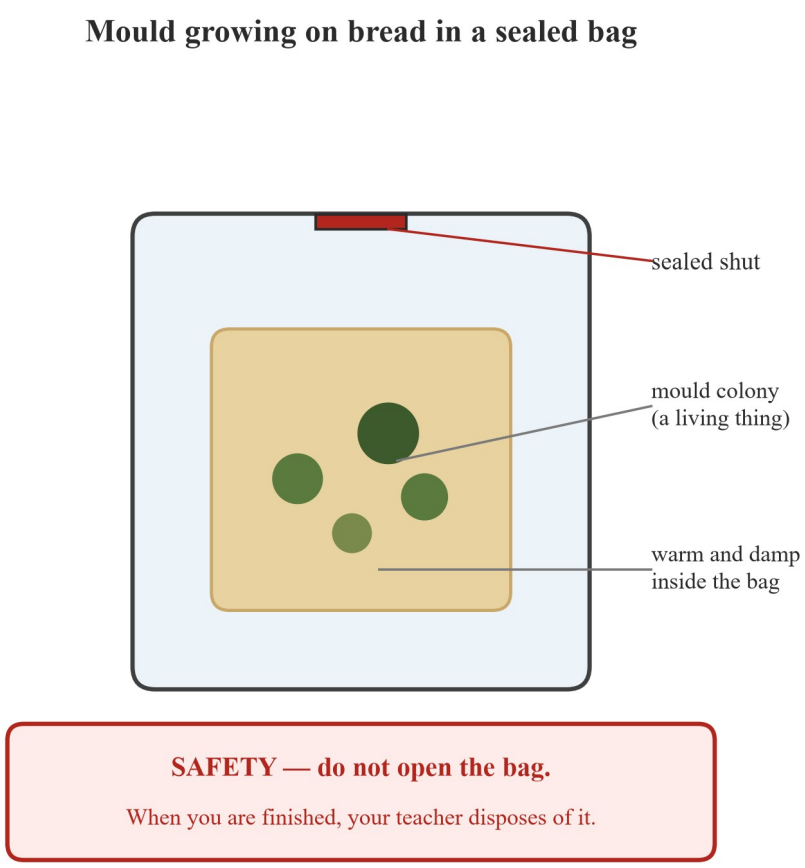
- A seed waits in the soil until it has **water**; then it starts to grow, or **sprouts**. In a dry spell the seed simply waits.
- An egg only **hatches** if it is kept at the right **temperature**. Too cold, and the young animal inside does not develop.
- A pond or a creek can dry up when the weather is hot and rain is low: the water evaporates. When the water goes, the fish and other animals that live there must move, or they die.

So the conditions of a habitat gate the stages of life as well as growth and survival.

Mould in a sealed bag

Mould is a living thing. It is not a plant — it cannot make its own food. A **colony** is a growing group of the same living thing; the fuzzy spots you see on old bread are mould colonies.

Mould grows well when it is warm and damp. A simple way to see conditions act on a living thing is to put a slice of bread in a plastic bag, dampen it, seal the bag shut, and leave it somewhere warm. Over one to two weeks, mould colonies appear and grow.



A slice of bread with mould colonies growing inside a sealed plastic bag, labelled warm and damp inside; safety note: do not open the bag, and when finished your teacher disposes of it.

> **SAFETY** — do not open the bag. Mould can trouble breathing and cause allergies. When you are finished, your teacher disposes of the sealed bag.

The same idea works as a fair test: a second sealed bag left somewhere cold (such as a fridge) grows much less mould, because the temperature is different. The conditions decide how well the mould grows.

Worked examples

Example 1 — with support

Use the Melbourne seasons graph in the Theory. (a) Read the usual daytime high for January. (b) Name the season of July in Victoria. (c) A certain plant only grows well when the usual daytime high is 20 °C or more. In which months could this plant grow well in Melbourne?

Working	Comment
(a) Find Jan on the top graph and read the red line: 26.8 °C.	The red line is the usual daytime high for each month.
(b) July is in winter in Victoria.	Seasons are southern-hemisphere: winter is June, July and August.
(c) Read across the red line: it is at 20 or above from November (22.2 °C) through April (24.3 °C).	October (20.5 °C) is also at 20 or above; May (17.6 °C) is below.
∴ (a) 26.8 °C. (b) Winter. (c) October to April.	A graph of conditions across a year lets us read which months suit a living thing.

Example 2 — with support

A class grows two trays of bean seedlings in the same soil, in the same light and warmth. One tray is watered with fresh water and one with salty water. After two weeks, the fresh-water tray is green and strong; the salty-water tray is

pale and wilted. (a) Which condition was changed? (b) Name two conditions that were kept the same. (c) Explain the difference in growth.

Working	Comment
(a) The salinity of the water: fresh in one tray, salty in the other.	The one we change is the condition we are testing.
(b) The soil and the light (and the warmth).	Keeping conditions the same makes the test fair.
(c) The salt makes it hard for the plants to take in water, so the salty-water plants wilt and grow badly.	Salinity is a physical condition that changes growth.
∴ Changing one condition — the salinity — changed the growth of the plants.	This is what "a change in a condition affects growth" looks like in a fair test.

Example 3 — by yourself

A council replaces dim old lamps with bright new lights along a path through a park where owls and flying foxes live. Predict two effects of the brighter night light on these animals, and explain each.

Practice questions

With support

Q1. Write a sentence, in your own words, for each word: *(3 marks)* (a) habitat (b) physical conditions (c) salinity

Q2. Name four physical conditions of a forest habitat. *(4 marks)*

Q3. Each sentence describes one physical condition. Name it: *(3 marks)* (a) how hot or cold it is (b) how much salt is in the water (c) places where animals can hide and rest

Q4. Look at the day and night diagram. *(3 marks)* (a) Name two conditions that change between day and night. (b) Say how each of them is different at night.

Q5. Look at the two potted plants diagram. *(3 marks)* (a) Which condition was different for the two plants? (b) Which plant grew better? (c) Why do plants need this condition?

Q6. Look at the coral diagram. *(2 marks)* (a) What change in a condition causes bleaching? (b) Why can a bleached coral starve?

By yourself

Q7. Use the Melbourne seasons graph. *(3 marks)* (a) Read the usual daytime high for January and for July. (b) Which season is the coldest in Victoria? How does the graph show this? (c) Does the rain stop in any month? How do you know?

Q8. A pond dries up through a hot spell with little rain. *(3 marks)* (a) Name two physical conditions that change for the animals living in the pond. (b) Explain why the fish must move.

Q9. Two nests of turtle eggs are laid on a beach. One nest stays warm; the other is left in deep shade and gets cold. Predict which nest will hatch and explain your prediction. *(2 marks)*

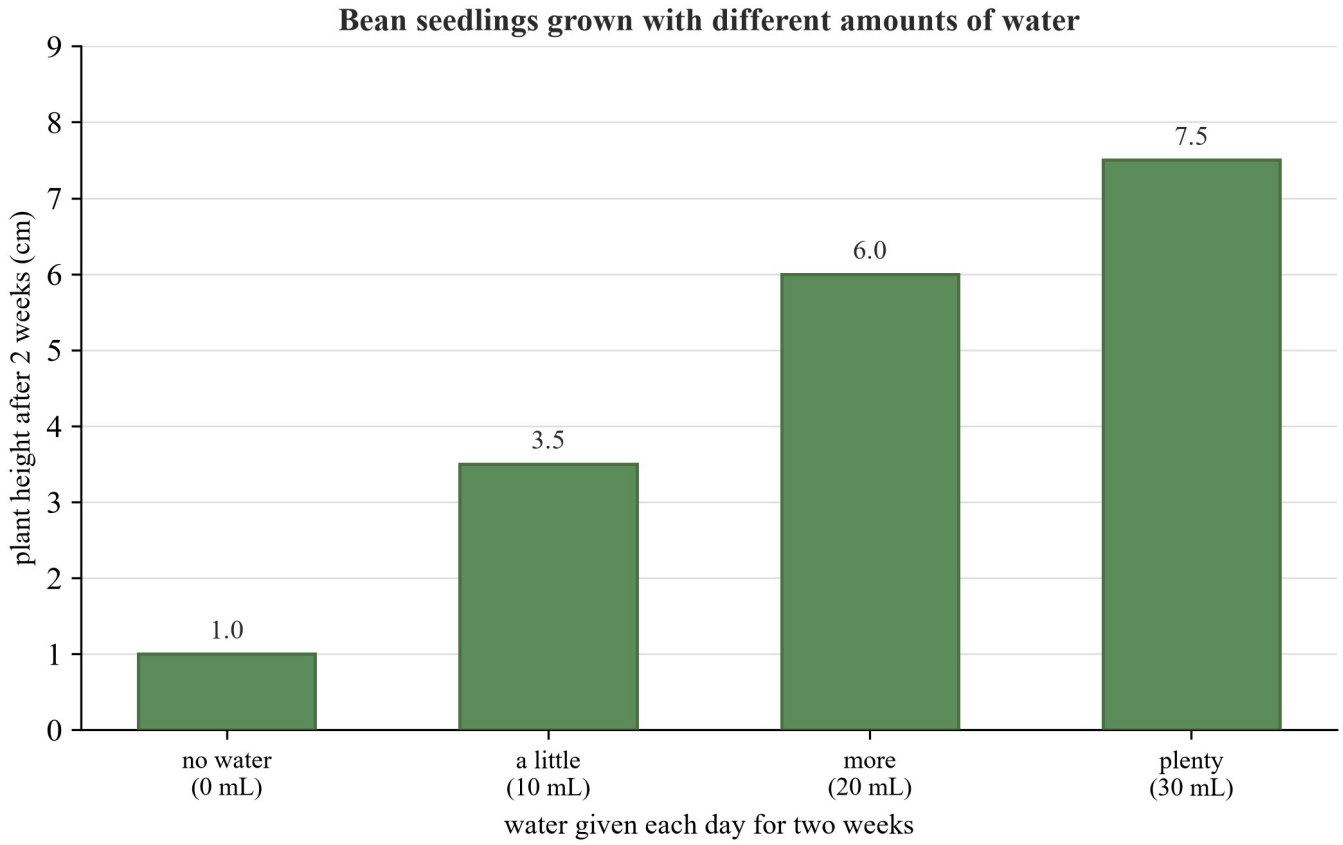
Q10. On very hot days, grey-headed flying foxes rest in the shade. In a heatwave, many flying foxes become ill and die. *(3 marks)* (a) What does a flying fox do to get through a very hot day? (b) Explain how the heatwave changes the survival of the flying foxes.

Q11. On cold days, honey bees stay inside the hive, huddle in a ball and shiver to keep warm. *(3 marks)* (a) What do the bees do on cold days? (b) Explain why this makes it hard for the hive to collect food. (c) Name the physical condition that changed.

Q12. City street lights keep the night bright. *(4 marks)* (a) What does nocturnal mean? (b) Name two effects of bright night light on animals, and explain one of them.

Q13. Look at the fresh-water and salty-water seedlings diagram. *(3 marks)* (a) What was different about the conditions in the two trays? (b) Which seedling grew well? (c) What does this tell you about watering crops with salty water?

Q14. A class grows bean seedlings, giving each pot a different amount of water each day for two weeks. Every pot gets the same light and warmth. The bar chart shows the heights after two weeks. *(5 marks)*



SCENARIO — class investigation data, one pot per amount, all pots kept in the same light and warmth.

A bar chart of a class investigation: bean seedlings given no water, a little, more or plenty each day for two weeks, with taller plants for more water.

(a) Describe the pattern in the bar chart. *(1 mark)*

(b) Which physical condition was changed? *(1 mark)*

(c) Name two conditions that were kept the same. *(2 marks)*

(d) What can you conclude about water and the growth of bean seedlings? *(1 mark)*

Q15. A slice of damp bread is sealed in a plastic bag and left somewhere warm. After two weeks, fuzzy mould colonies cover part of it. *(3 marks)* (a) Name two conditions inside the bag that helped the mould grow. (b) Why is the bag sealed shut? (c) What must you not do with the bag, and who disposes of it?

Q16. SCENARIO — a small creek in western Victoria holds water all year in most years. In a hot, dry summer the creek gets lower and the water gets hot. *(4 marks)* (a) Name two physical conditions of the creek that change. (b) Predict the effect of these changes on one living thing in the creek. (c) Explain your prediction.

Practical — how does water change the growth of bean seedlings?

PRACTICAL — this page plans or reviews work done in the classroom, laboratory or field. It is not a substitute for doing it.

Question: How does the amount of water given each day change the growth of bean seedlings? (Your teacher may give your group a different condition to test — light, salinity or temperature. The plan below stays the same; only the condition you change is different.)

Equipment: one small pot with holes in the bottom; one bean seed; the same soil as every other pot in the class; a cup with mL marks; a ruler marked in cm; a label and a pencil; a tray to catch water.

Safety: There is no heating, no glass and no mains power in this activity. Do not eat the seeds or the soil — they are not food. Wash your hands after handling soil and seeds. Wipe up spilled water so nobody slips.

Risk	How we stay safe
Water spilled on the bench or floor	Wipe it up straight away so nobody slips.
Soil or dust in the eyes	Do not rub; rinse with water and tell your teacher.
Seeds or soil eaten by mistake	Seeds and soil are not food; wash hands after handling them.

What we change, measure and keep the same:

	Choice
The one we change	the water given each day: 0 mL, 10 mL, 20 mL or 30 mL — one amount per pot
The one we measure	the height of the seedling after 2 weeks (cm)
The ones we keep the same	the same pot size; the same soil; one seed per pot; the same spot, so the same light and warmth; the same two weeks

Every pair of students in the class grows one pot. The pots with the same amount of water are the repeats of that amount — the whole class builds the data set together.

Method:

1. Fill your pot with soil to 1 cm below the top. Make a small hole, place the bean seed in it, and cover it lightly.
2. Write your names and your water amount on the label and put it on the pot.
3. Put your pot on the class tray, in the same spot as every other pot.
4. Each day for 2 weeks, measure your water amount with the mL cup and give it to your pot.
5. After 2 weeks, measure the height of your seedling in cm with the ruler. Record the reading.
6. Measure two more times, so you have three readings. Compare them: if two readings are close and one is very different, measure again and keep the reading that fits.
7. Put your height in the class table, next to the other pots that had the same amount of water.

Results: record your readings in a table like this one.

Reading	Height (cm)
1	
2	
3	

Then copy your height into the class table.

Water each day	Heights of the pots with this amount (cm)
0 mL	
10 mL	
20 mL	
30 mL	

Do your three readings agree with each other? Do the pots with the same amount agree with each other?

Thinking about the results:

1. Describe the pattern in the class table as the amount of water goes up.
2. Did the pots with the same amount of water give close readings? What does that tell you about the pattern?
3. Why did every pot have to sit in the same spot, with the same light and warmth?
4. Predict what the class table would look like if the water in the cups were salty, and explain your prediction.

Make a claim and defend it. Finish this writing frame in full sentences:

- I claim that water _____ .
- My evidence is _____ .
- This is a fair test because _____ .
- If someone claimed the light caused the difference, I would answer _____ .

Answers

Q1 (a) A habitat is the place where a living thing lives. (b) The physical conditions are the non-living parts of a habitat, such as temperature, light and water. (c) Salinity is how much salt is in the water. **Q2** Any four of: temperature, light, water, salinity, soil, shelter. **Q3** (a) Temperature. (b) Salinity. (c) Shelter. **Q4** (a) Light and temperature. (b) At night it is dark (no sunlight) and the air is cool. **Q5** (a) Light — one plant had light and one was in the dark. (b) The plant with light. (c) Plants make their own food in their leaves, and they need light to do it. **Q6** (a) The water getting too warm. (b) The coral has lost the tiny living things that gave it much of its food, so it can starve. **Q7** (a) January 26.8 °C; July 14.5 °C. (b) Winter — the daytime highs and night-time lows are lowest in June, July and August. (c) No — the bottom graph shows a rain bar in every month. **Q8** (a) Water (the pond is drying) and temperature (the water left gets hotter). (b) Fish live in water; when the water goes they have nowhere to live, so they must move or die. **Q9** The warm nest. An egg only hatches if it is kept at the right temperature; the cold nest is too cold for the young turtles to develop. **Q10** (a) It rests in the shade. (b) The heat is beyond what the flying foxes can cope with, so they become ill and many die — the change in temperature lowers their survival. **Q11** (a) They stay inside the hive, huddle in a ball and shiver to keep warm. (b) While they stay inside they cannot fly out to flowers, so the hive collects less food. (c) Temperature. **Q12** (a) Active at night. (b) Any two of: insects gather around lights and get tired or get eaten; nocturnal animals are woken or confused by the glow; birds that migrate at night are pulled off their path. Explanation of one. **Q13** (a) The salinity of the water. (b) The fresh-water seedling. (c) Salty water makes plants grow badly, so crops watered with salty water would grow badly too. **Q14** (a) The more water each day, the taller the plant. (b) The amount of water. (c) Any two of: the same light; the same warmth; the same soil; the same pot; the same two weeks. (d) Water changes growth: with more water (up to 30 mL a day) the seedlings grew taller. **Q15** (a) Warmth and damp (water). (b) To keep the mould and its spores inside, so nobody breathes them in. (c) Do not open the bag; the teacher disposes of it. **Q16** (a) Any two of: the amount of water; the temperature of the water; the shelter the creek gives. (b) For example: the fish have less water to live in. (c) Less water means less room and less food, and hot water is harder to live in, so the fish may die or must move.

Worked solutions

Q1 *(3 marks: 1 each)* (a) A habitat is the place where a living thing lives. *1 mark* (b) The physical conditions are the non-living parts of a habitat — its temperature, light, water, salinity, soil and shelter. *1 mark* (c) Salinity is how much salt is in the water. *1 mark*

Q2 *(4 marks: 1 each)* Temperature, light, water and soil (salinity and shelter also count). *1 mark each*

Q3 *(3 marks: 1 each)* (a) Temperature. (b) Salinity. (c) Shelter. *1 mark each*

Q4 *(3 marks)* (a) Light and temperature. *2 marks (1 each)* (b) At night there is no sunlight, so it is dark, and the air is cool rather than warm. *1 mark*

Q5 *(3 marks: 1 each)* (a) Light — one plant grew with light and one grew in the dark. *1 mark* (b) The plant with light grew better: green and strong, not pale and weak. *1 mark* (c) Plants make their own food in their leaves and need light to do it, so without light the plant starves and stays weak. *1 mark*

Q6 *(2 marks: 1 each)* (a) The water getting too warm. *1 mark* (b) The coral loses the tiny living things inside it that gave it much of its food, so it can starve. *1 mark*

Q7 *(3 marks: 1 each)* (a) January: 26.8 °C. July: 14.5 °C. *1 mark* (b) Winter — the red and blue lines are lowest in June, July and August. *1 mark* (c) No — the rainfall graph has a bar in every month, so some rain falls all year. *1 mark*

Q8 *(3 marks)* (a) The amount of water (the pond is drying) and the temperature of the water left (it gets hotter). *2 marks (1 each)* (b) A fish lives in water; when the water evaporates the fish has nowhere to live, so it must move or it dies. *1 mark*

Q9 *(2 marks)* The warm nest will hatch. *1 mark* An egg only hatches if it is kept at the right temperature, and the shaded nest is too cold for the young turtles to develop. *1 mark*

Q10 *(3 marks)* (a) It rests in the shade to get through the heat. *1 mark* (b) In a heatwave the temperature goes beyond what flying foxes can cope with, so they become ill and many die. *1 mark* The change in one condition (temperature) lowers the survival of the animals. *1 mark*

Q11 *(3 marks: 1 each)* (a) They stay inside the hive, huddle together in a ball and shiver to keep warm. *1 mark* (b) While they are inside they cannot fly out to flowers, so the hive collects less food. *1 mark* (c) Temperature. *1 mark*

Q12 *(4 marks)* (a) Nocturnal means active at night. *1 mark* (b) Two effects, for example: insects gather around the lights and get tired or get eaten; and nocturnal animals are woken or confused by the glow. *2 marks (1 each)* Explanation of one, for example: the insects fly round the light all night instead of feeding, so they use up their energy and get eaten by animals that hunt at the light. *1 mark*

Q13 *(3 marks: 1 each)* (a) The salinity of the water: fresh in one tray, salty in the other. *1 mark* (b) The fresh-water seedling grew well. *1 mark* (c) Salt in the water makes plants grow badly, so crops watered with salty water would grow badly too. *1 mark*

Q14 *(5 marks)* (a) The more water a pot got each day, the taller the seedling grew: 1.0 cm with no water up to 7.5 cm with plenty. *1 mark* (b) The amount of water given each day. *1 mark* (c) Any two of: the same light, the same warmth, the same soil, the same pot, the same two weeks. *2 marks (1 each)* (d) Water changes the growth of bean seedlings: more water (up to 30 mL a day) gave taller plants. *1 mark*

Q15 *(3 marks: 1 each)* (a) Warmth and damp — the bag is warm and damp inside. *1 mark* (b) To keep the mould and its spores sealed inside, so nobody breathes them in. *1 mark* (c) Do not open the bag; when finished, the teacher disposes of the sealed bag. *1 mark*

Q16 *(4 marks)* (a) Any two of: the amount of water (the creek gets lower), the temperature of the water (it gets hot), the shelter the deep water gave. *2 marks (1 each)* (b) For example: the fish have less water to live in, and the water is hotter. *1 mark* (c) Less water means less room and less food, and hot water is harder for the fish to live in, so the fish may die or must move to deeper, cooler water. *1 mark*

Surviving here: change over time, features and behaviours

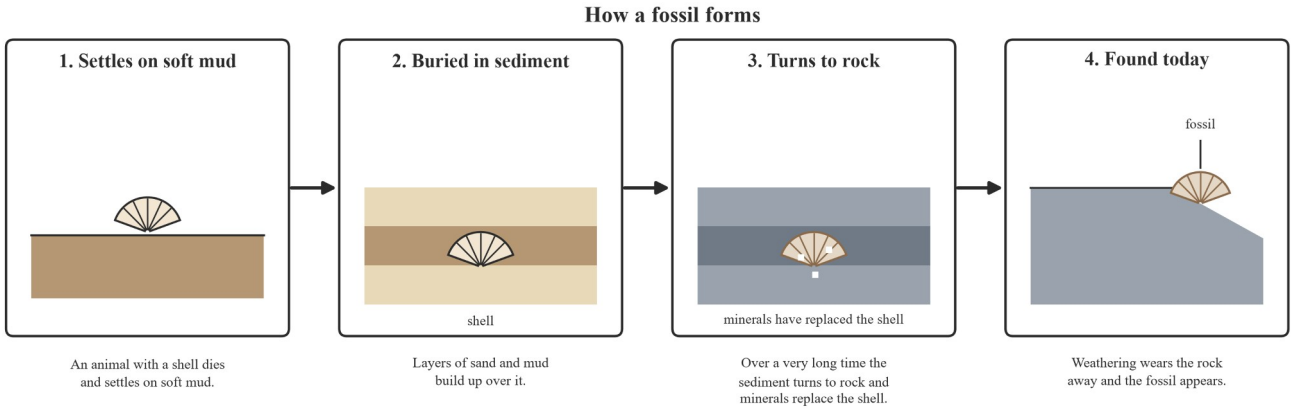
Words to know organism · environment · fossil · sediment · evidence · extinct · structural feature · behaviour · adaptation · camouflage · nocturnal · hibernation · torpor · variation · offspring · advantage · disadvantage · predator · prey · weathering · mineral

An **organism** is any living thing — a gum tree, a wombat, a honeyeater, you. Organisms live in very different **environments**, from the hot, dry centre of Australia to the cold, wet forests of Victoria, and each environment asks different things of the organisms in it. In this section we look at the evidence that organisms have changed over time, and at the features and behaviours that let them thrive where they live.

Theory

Change over time: fossils as evidence

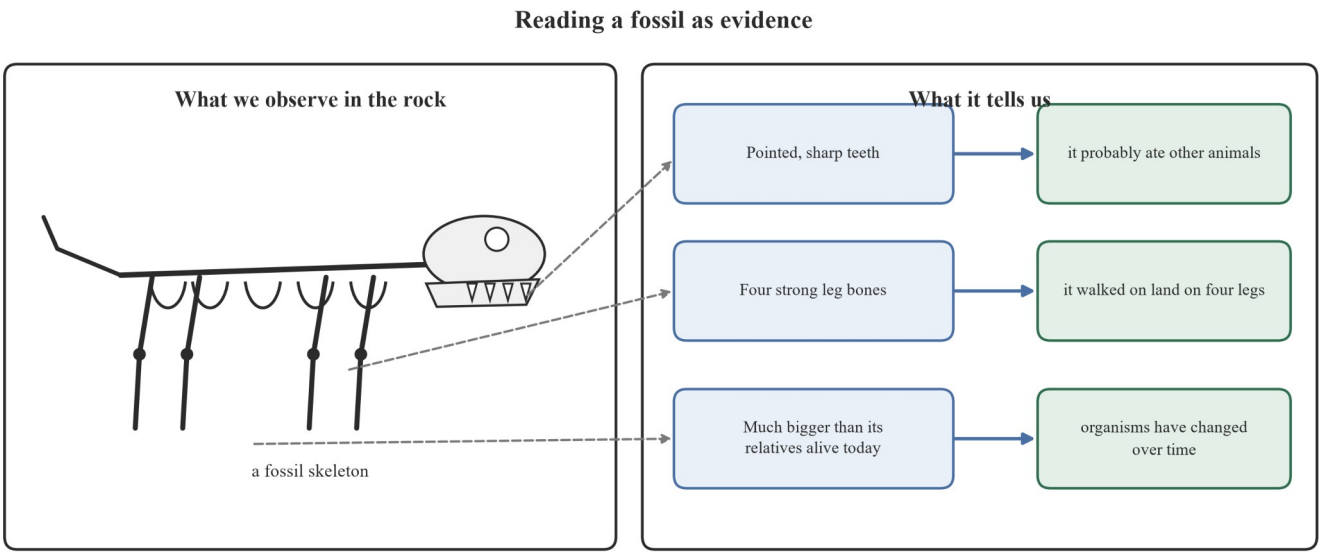
How do we know that organisms have changed over time? We know it from **evidence** — things we can observe and measure that tell us something about the world. The most famous evidence is **fossils**. A **fossil** is the preserved remains of a living thing from long ago, or the trace it left, usually found in rock.



The four stages of how a fossil forms: an animal with a shell dies and settles on soft mud; layers of sand and mud build up over it; over a very long time the sediment turns to rock and minerals replace the shell; weathering wears the rock away and the fossil appears.

Most fossils form in **sediment** — sand and mud that settles in layers, for example on the bottom of a sea or a lake. When an animal with a shell dies and settles on soft mud, layers of sediment can bury it. Over a very long time the sediment turns to rock, and **minerals** — the natural solid materials that make up rock — slowly replace the shell, part by part, so its shape is kept in the rock. Later, **weathering** — the slow breaking-up and wearing-away of rock by wind, rain and changing temperature — wears the rock away and the fossil appears where we can find it.

A fossil is not just a curiosity — it is evidence we can read. We look at what we observe in a fossil, and we work out what each observation tells us.

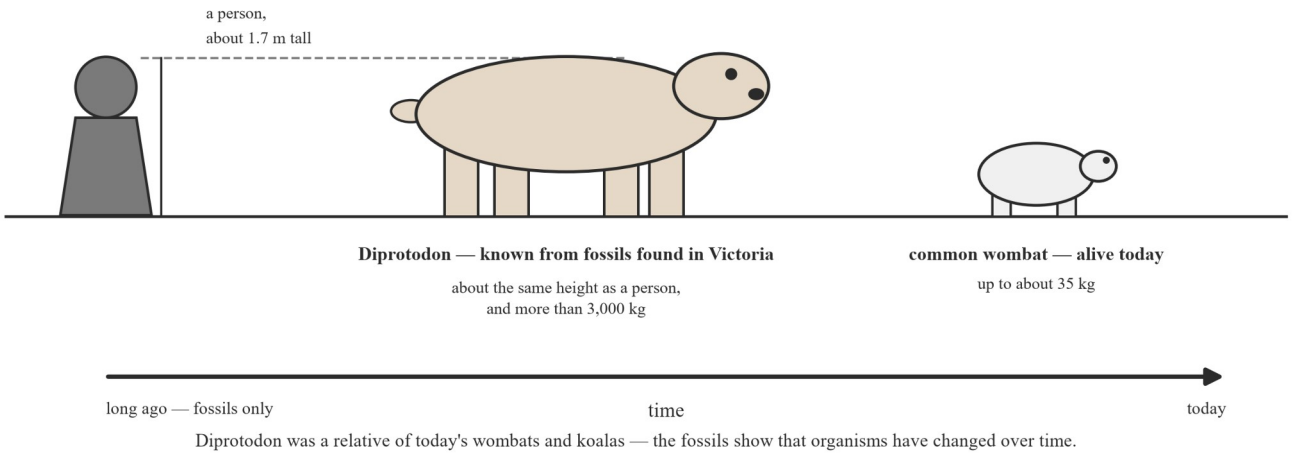


Reading a fossil skeleton as evidence: pointed, sharp teeth tell us its food was meat; four strong leg bones tell us it walked on land on four legs; being huge next to its living relatives tells us organisms have changed over time.

Some of the most famous fossil sites in the world are in Australia. At Dinosaur Cove, on the Victorian coast near Cape Otway, fossils of small dinosaurs such as *Leaellynasaura* have been found in rocks about 106 million years old. At that time the land that is now Australia was joined to Antarctica and sat inside the Antarctic Circle, so for months each year it was dark. Many of these dinosaurs had very large eye sockets, like animals today that see well in dim light — evidence that they could see and find food through the long dark months.

Source: Museums Victoria, 'Dinosaur Cove', Museums Victoria collections — retrieved 2026-08-21.

Victoria's fossils also include *Diprotodon*, the largest marsupial that has ever lived. *Diprotodon* was a relative of today's wombats and koalas. It stood about as high as a person at the shoulder, and the biggest ones weighed more than 3,000 kg — compare a common wombat at up to about 35 kg. Its fossils have been found at Victorian sites such as Bacchus Marsh and Colac, yet there is no *Diprotodon* alive today: about 40,000 years ago it became **extinct**, which means it died out — not one of them was left alive on Earth.



Change over time: Diprotodon, known from fossils found in Victoria, stood about as high as a person and weighed more than 3,000 kg; the common wombat, one of its living relatives, is tiny next to it. A person about 1.7 m tall is shown for scale, and a time arrow runs from 'long ago — fossils only' to 'today'.

Source: Museums Victoria, 'Diprotodon', Museums Victoria collections — retrieved 2026-08-21.

Fossils like these show two things at once: that organisms long ago were different from organisms today, and that the features of those organisms — like the big eyes of *Leaellynasaura* — suited the places where they lived.

The scientific record: change we can measure

Fossils are not the only evidence. Scientists also keep **scientific records** — careful measurements and observations written down over years — and these records can show organisms changing over much shorter times than fossils do.

The cane toad is a sad-but-clear example. In 1935, cane toads were brought to Australia and released in the cane fields of north Queensland. The toads spread, and scientists have measured them ever since. Toads at the front edge of the spread have longer legs than the toads of 1935 and move faster: the toads have changed over time, and the change is written in the scientists' records, not in fossils.

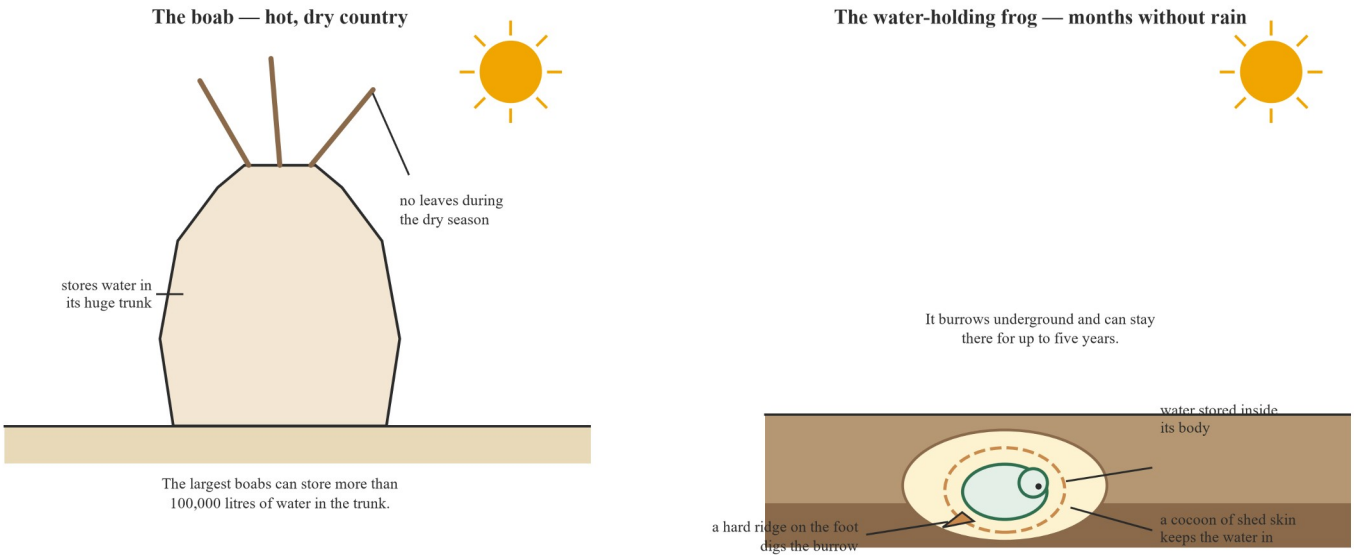
Source: Australian Museum, 'Cane Toad', Australian Museum; Phillips, Brown, Webb & Shine, Nature 439 (2006) — retrieved 2026-08-21.

The records show something else too: the toads that disperse fastest are the most likely to develop sore, damaged joints (spinal arthritis). The same long legs that help a toad travel fast also put extra strain on its body. A feature can help and hurt at the same time — which is exactly what the next idea is about.

Source: Brown, Schwarzkopf, Alford, Bower & Shine, Scientific Reports (2019) — retrieved 2026-08-21.

Features that suit an organism to its environment

A **structural feature** is a body part of an organism, or the shape of one — a beak, a claw, a trunk, a layer of fur, the colour of a shell. An **adaptation** is a feature or behaviour that helps an organism survive in its environment. The deserts of northern and central Australia are a good place to see structural adaptations, because water is scarce for months at a time.



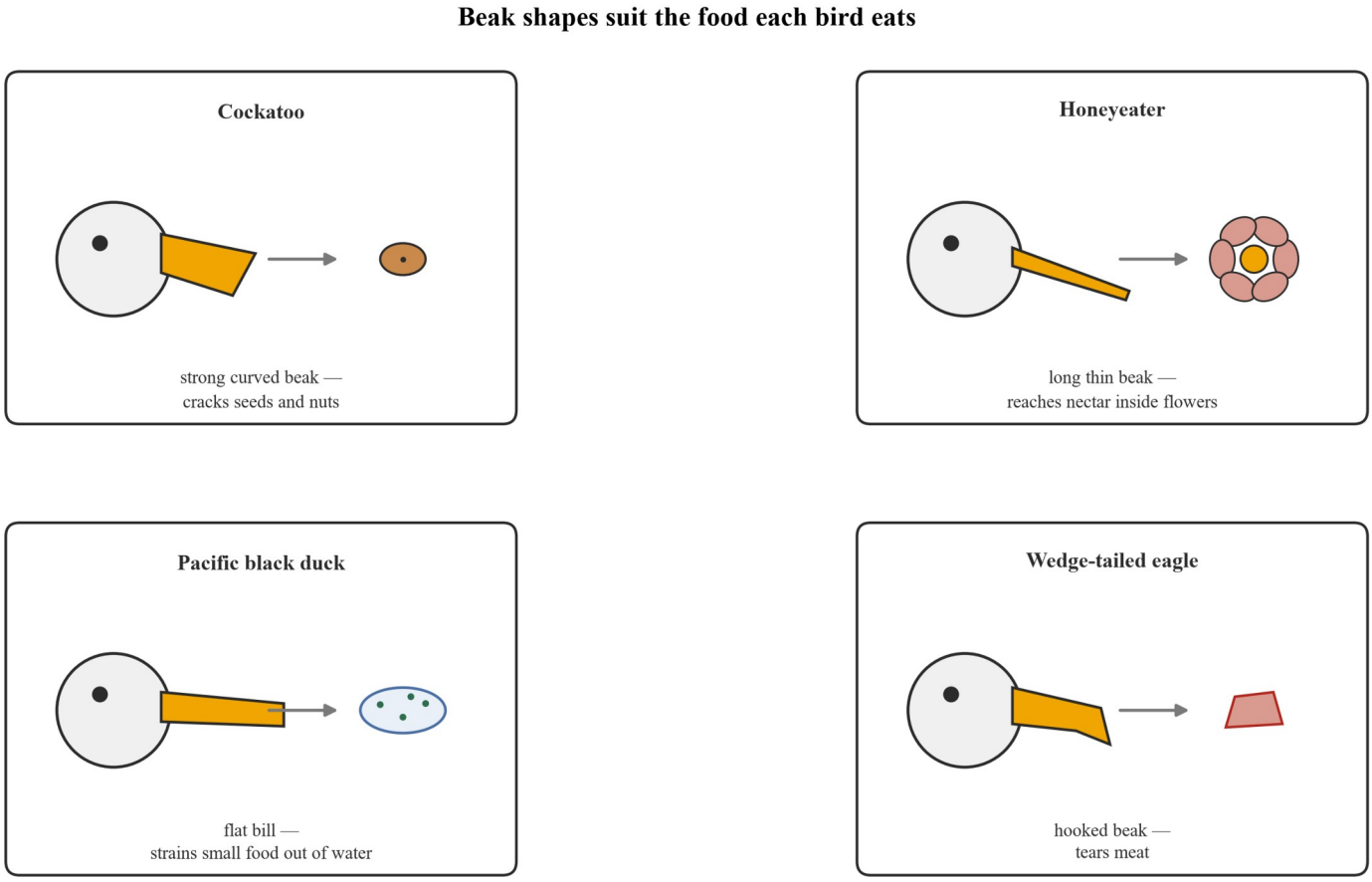
Two desert survivors. Left: the boab, a tree with a huge bottle-shaped trunk that stores water, shown bare of leaves in the dry season; the largest boabs can store more than 100,000 litres of water in the trunk. Right: soil cut open to show a water-holding frog curled up in an underground burrow, surrounded by a dashed cocoon of shed skin; it stores water inside its body and can stay underground for up to five years.

The boab stores water in its huge, bottle-shaped trunk — the largest boabs can hold more than 100,000 litres — and drops its leaves in the dry season so less water is lost. The water-holding frog soaks up water into its body when it rains, then uses a hard ridge on its foot to dig itself down into the soil, moving in reverse, and waits. Layers of its own shed skin form a cocoon around it that keeps the water in, and it can stay underground like this for up to five years until rain comes again.

Source: Atlas of Living Australia (CSIRO), ‘Adansonia gregorii F.Muell. – Boab’, Atlas of Living Australia — retrieved 2026-08-21.

Source: Australian Museum, ‘Water-holding Frog’, Australian Museum — retrieved 2026-08-21.

Beaks are another clear example: the shape of a bird’s beak suits the food it eats.

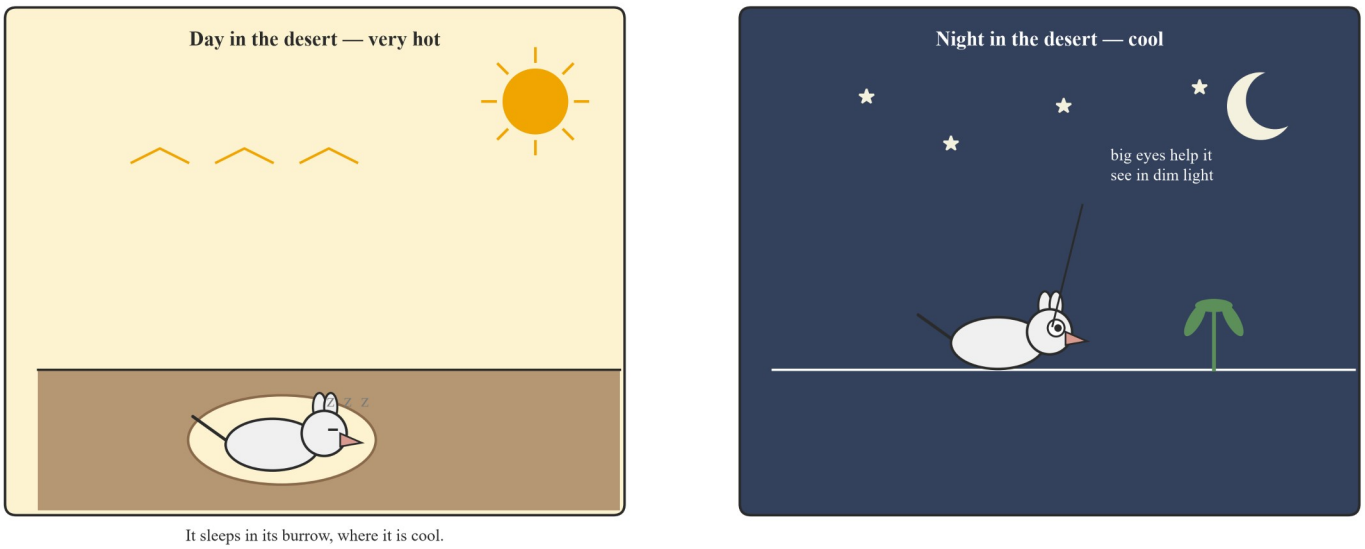


Four Australian birds with beak shapes matched to their food: the cockatoo's strong curved beak cracks seeds and nuts; the honeyeater's long thin beak reaches nectar inside flowers; the Pacific black duck's flat bill strains small food out of water; the wedge-tailed eagle's hooked beak tears meat.

A cockatoo's strong curved beak cracks hard seeds and nuts. A honeyeater's long thin beak reaches down into flowers to drink nectar. A Pacific black duck's flat bill strains small water plants and animals out of the water. A wedge-tailed eagle's hooked beak tears meat. Each beak is a structural feature that suits its owner to the food in its environment.

Behaviours that help

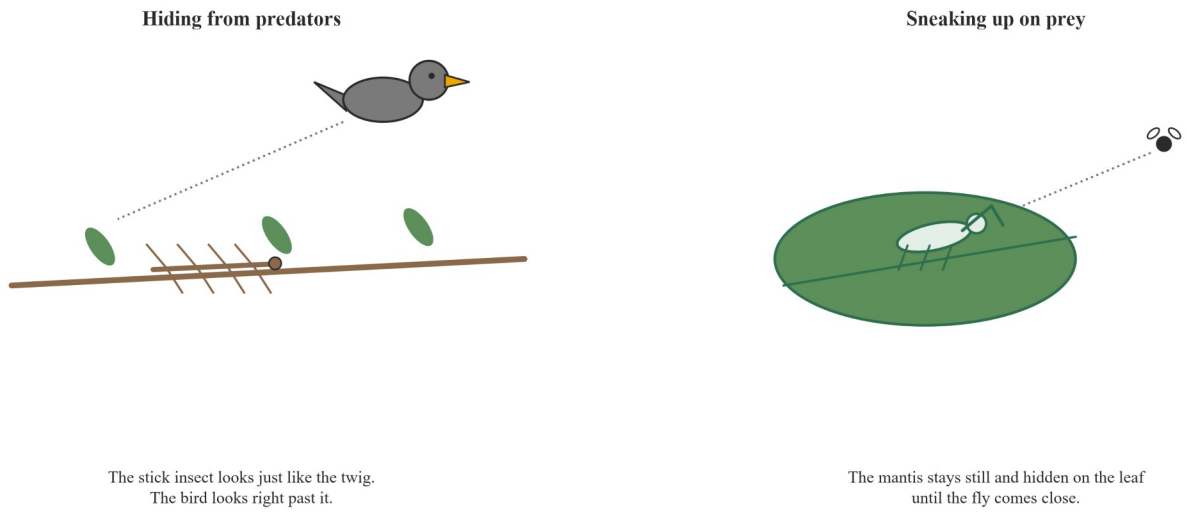
Not every adaptation is a body part. A **behaviour** is something an organism does — the way it acts. Behaviours can be adaptations too.



The same desert animal by day and by night. Day panel: hot sun and heat waves; the animal sleeps in its cool underground burrow. Night panel: moon and stars; the animal is out feeding in the cool, and its big eyes help it see in dim light.

Many desert animals are **nocturnal**, which means they are active at night and rest by day. By day the desert can be too hot to bear, so the animal sleeps in its cool burrow; by night it comes out to feed when it is cool. Nocturnal animals often have large eyes that gather what little light there is, so they can see in dim light.

Camouflage is an adaptation that uses both structure and behaviour: the body's colour and shape hide the animal, and staying perfectly still is the behaviour that makes the hiding work. Camouflage has two uses.

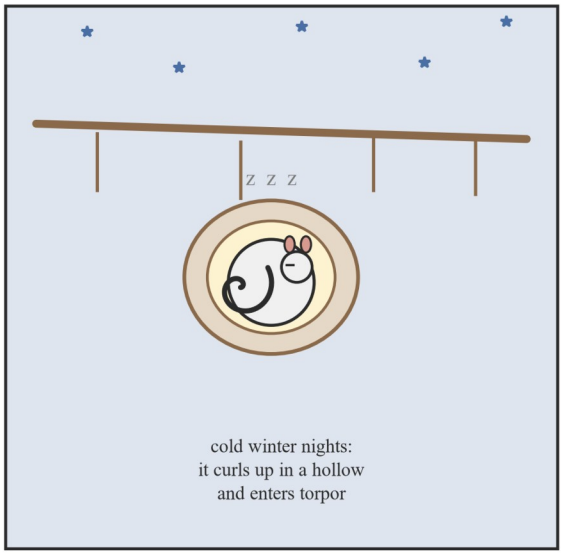


The two uses of camouflage. Left panel: a stick insect looks just like the twig it sits on, and a bird looks right past it — camouflage hides it from predators. Right panel: a green mantis stays still and hidden on a leaf until a fly comes close — camouflage helps it sneak up on prey.

An animal that is hard to see is hard to eat, so camouflage hides **prey** (the animals that are hunted) from **predators** (the animals that hunt them). But it also works the other way: a predator that is hard to see can wait, hidden, and **ambush** its prey when it comes close.

Some behaviours help an organism through the hard part of the year. Some animals get through winter with **hibernation** — a long, deep sleep through the cold months in which the animal uses very little energy. The eastern pygmy possum, a tiny animal of south-eastern Australia's forests, feeds at night on nectar and pollen. In winter, nights are cold and flowers are scarce, so the possum does something similar but shorter: it curls up in a hollow and enters **torpor**, a deep hibernation-like sleep in which its body temperature falls and its heartbeat and breathing slow right down, so it uses very little energy. It stays asleep for days at a time until food returns.

Winter torpor in the eastern pygmy possum



body about 7–11 cm long; mass 15–43 g

What changes during torpor?

	active and feeding	in torpor
body temperature	normal	falls a lot
heart beats	fast	much slower
breathing	normal	much slower
what it does	feeds at night	stays asleep for days at a time

Torpor saves energy when food is scarce and nights are cold.

Winter torpor in the eastern pygmy possum. Left: on cold winter nights the possum curls up in a hollow and enters torpor; its body is only about 7–11 cm long and its mass is 15–43 g. Right: a comparison table — when active and feeding its body temperature, heartbeat and breathing are normal, but in torpor its body temperature falls a lot, its heartbeat and breathing become much slower, and it stays asleep for days at a time.

Source: Australian Museum, 'Eastern pygmy possum', Australian Museum — retrieved 2026-08-21.

Every feature has a price: advantages and disadvantages

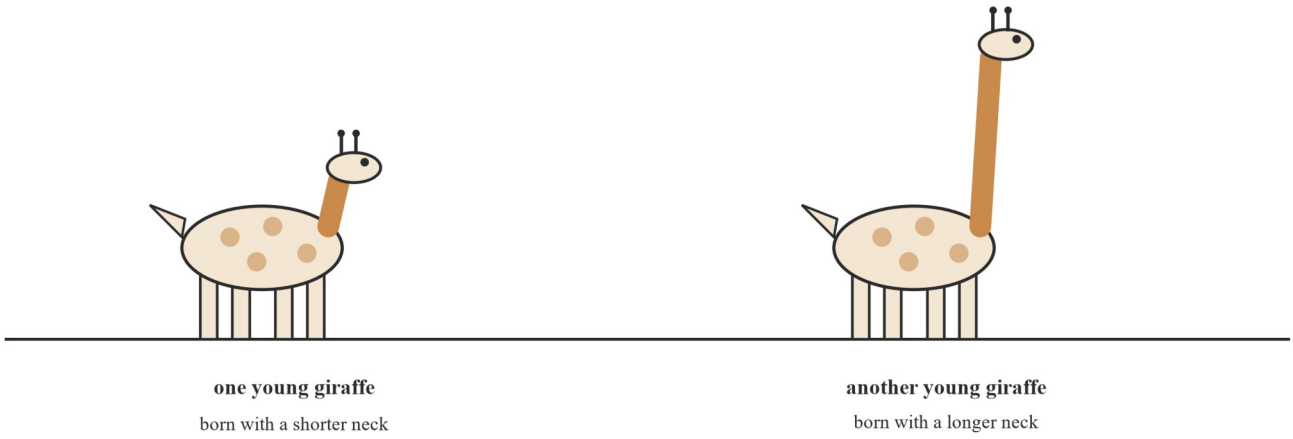
An **advantage** is a way a feature helps an organism; a **disadvantage** is a way the same feature makes life harder. Every feature has both sides, and analysing them means looking at both.

- The cane toads at the front of the spread have long legs. **Advantage:** they travel further and faster, so they reach new food and water first. **Disadvantage:** the long legs strain their bodies, and the fastest toads are the most likely to develop sore, damaged joints.
- A wedge-tailed eagle's hooked beak. **Advantage:** it tears meat with ease. **Disadvantage:** it is the wrong shape to sip nectar or to strain small food from water, so the eagle must get its food another way.
- The water-holding frog's cocoon. **Advantage:** it keeps the water in through years without rain. **Disadvantage:** while sealed underground the frog cannot feed or move about at all.

Variation: why differences matter over time

Look at any family — human or not — and the **offspring** (the young) are not exact copies of their parents or of each other. This difference between members of the same family is called **variation**.

Variation: not every giraffe is the same



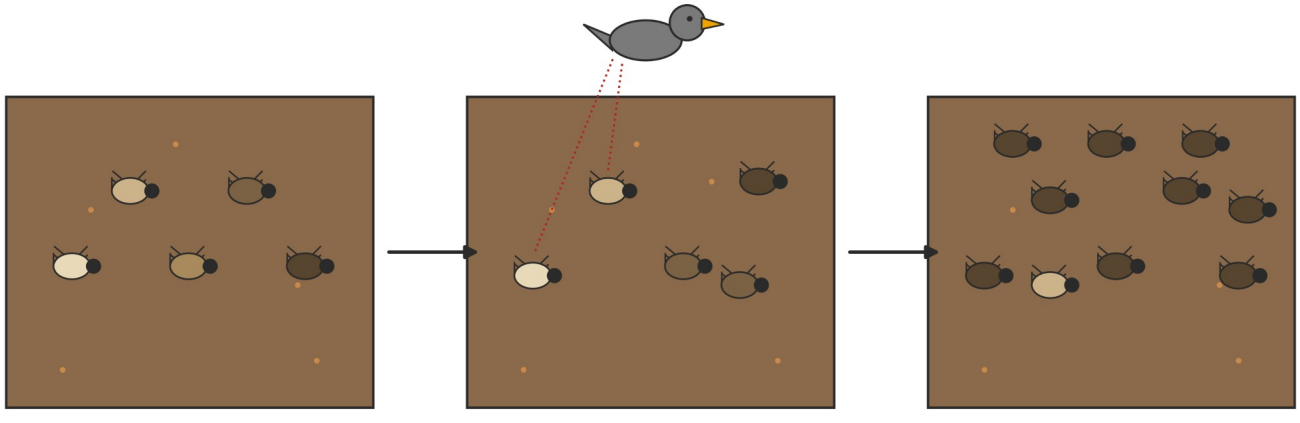
Offspring are not exact copies of their parents. In every family there is variation.

Variation in giraffes: two young giraffes born in the same season, one with a shorter neck and one with a longer neck. Offspring are not exact copies of their parents; in every family there is variation.

You can see variation in every family: some young giraffes are born with slightly longer necks than others, chameleons in one brood differ in colour, and pygmy possums differ in how long they can stay in torpor. The fossil record adds the time direction: the ancestors of modern giraffes had shorter necks, so over time the neck length of the family has changed.

Why does variation matter? Because environments change too — a place can become drier, colder, or gain a new predator — and variation means some offspring already have features that suit the new conditions a little better.

Variation in a family of beetles, living on dark soil



Beetles that survive are more likely to have young like them, so the helpful form becomes more common over time.

Variation in a family of beetles living on dark soil, in three panels. First panel: one family of beetles in which the young are not all the same, from pale to dark. Second panel: on dark soil the pale beetles are easier for a bird to see. Third panel: many generations later, most beetles are dark. Beetles that survive are more likely to have young like them, so the helpful form becomes more common over time.

On dark soil, a pale beetle is easy for a bird to see and a dark one is hard to see. The beetles that survive are more likely to have young, and their young tend to be like them — so, over many generations, the form that helps survival

becomes more common. This is the same slow process the fossils and the scientific records show: organisms have **evolved** over time, and the features and behaviours we see today are the ones that enabled their owners to thrive.

Worked examples

Example 1 — with support

The fossils of a small dinosaur, *Leaellynasaura*, were found at Dinosaur Cove on the Victorian coast, in rocks about 106 million years old. The skulls have very large eye sockets. Read each observation in the table and check the comment: notice how each thing we observe becomes something we can work out.

Working	Comment
Fossils of the dinosaur are found in rock at Dinosaur Cove.	A fossil is the preserved remains of a living thing from long ago — evidence that it lived there.
The rock is about 106 million years old.	So the dinosaur lived about 106 million years ago: organisms have changed since then.
The skulls have very large eye sockets, like animals today that see in dim light.	We can work out that it had large eyes and saw well in dim light.
At that time the land sat inside the Antarctic Circle — dark for months each year.	Large eyes would have helped it find food through the long dark months.
∴ The fossils are evidence of change over time, and the large eyes were a feature that suited the dark place where it lived.	Fossils let us read both halves of this idea: change over time, and features that help survival.

Example 2 — with support

A plant has brightly coloured, scented flowers. Analyse this adaptation: give one advantage and one disadvantage.

Working	Comment
Advantage: insects such as bees notice the coloured, scented flowers and visit them.	An advantage is a way the feature helps.
The visits carry pollen from flower to flower, so the plant makes more seeds.	This helps the plant have offspring.
Disadvantage: plant-eating animals can see the bright flowers too.	A disadvantage is a way the same feature makes life harder.
Some flowers get eaten, so those plants make fewer seeds.	One feature can help and hurt at the same time.
∴ Advantage: insects find the flowers and help the plant make seeds. Disadvantage: plant-eaters also find the flowers and may eat them.	To analyse an adaptation, always look at both sides.

Example 3 — by yourself

The water-holding frog lives where it may not rain for months or even years. Name two structural features and one behaviour of this frog, and explain how each one helps it survive until the rain returns.

Practice questions

With support

Q1. Write a sentence, in your own words, for each word: *(3 marks)* (a) fossil (b) behaviour (c) variation

Q2. Name the two kinds of evidence that show organisms have changed over time, and give one example of each from this section. *(3 marks)*

Q3. About the water-holding frog: *(3 marks)* (a) What is a structural feature? (b) Give one structural feature of this frog. (c) Give one behaviour of this frog.

Q4. Use the beak diagram to answer: *(3 marks)* (a) Which bird's beak is suited to cracking hard seeds and nuts? (b) Which bird strains small food out of the water? (c) Why does the honeyeater's beak suit feeding on flowers?

Q5. Many desert animals are nocturnal. *(3 marks)* (a) What does nocturnal mean? (b) How does being nocturnal help an animal survive in a hot desert? (c) Name one structural feature that helps nocturnal animals see at night.

Q6. A wedge-tailed eagle has a hooked beak. *(3 marks)* (a) Give one advantage of the hooked beak. (b) Give one disadvantage of the hooked beak. (c) What word means a feature or behaviour that helps an organism survive in its environment?

By yourself

Q7. *Diprotodon* fossils are found in Victoria, but there is no *Diprotodon* alive today. *(2 marks)* (a) What word means "died out, with not one left alive"? (b) What do these fossils tell us about organisms over time?

Q8. Fossils of the small dinosaur *Leaellynasaura* were found at Dinosaur Cove in rocks about 106 million years old. At that time the land sat inside the Antarctic Circle, so it was dark for months each year. The skulls have very large eye sockets. *(3 marks)* (a) About how old are the fossils? (b) The large eye sockets are evidence for what, about the dinosaur's eyes? (c) Explain how that feature would have helped it survive where it lived.

Q9. The boab grows in the hot, dry north of Australia. *(3 marks)* (a) Name the structural feature that stores water. (b) How does dropping its leaves in the dry season help the boab? (c) The boab's trunk is a structural feature. Is the dropping of leaves a structural feature or a behaviour? Explain your choice.

Q10. Camouflage is used by animals to hide from predators and to ambush prey. *(3 marks)* (a) Explain how camouflage helps a prey animal. (b) Explain how camouflage helps a predator. (c) Camouflage works best when the animal stays still. Is "staying still" a structural feature or a behaviour? Explain.

Q11. Use the torpor table in the diagram of the eastern pygmy possum. *(3 marks)* (a) What happens to the possum's body temperature in torpor? (b) What happens to its heartbeat and breathing? (c) Explain how torpor helps the possum survive a cold winter when flowers are scarce.

Q12. SCENARIO — A class runs a beak simulation. Each tool stands in for a beak shape, and each "beak" gets 30 seconds to pick up as many beads as it can. Three trials are done for each tool:

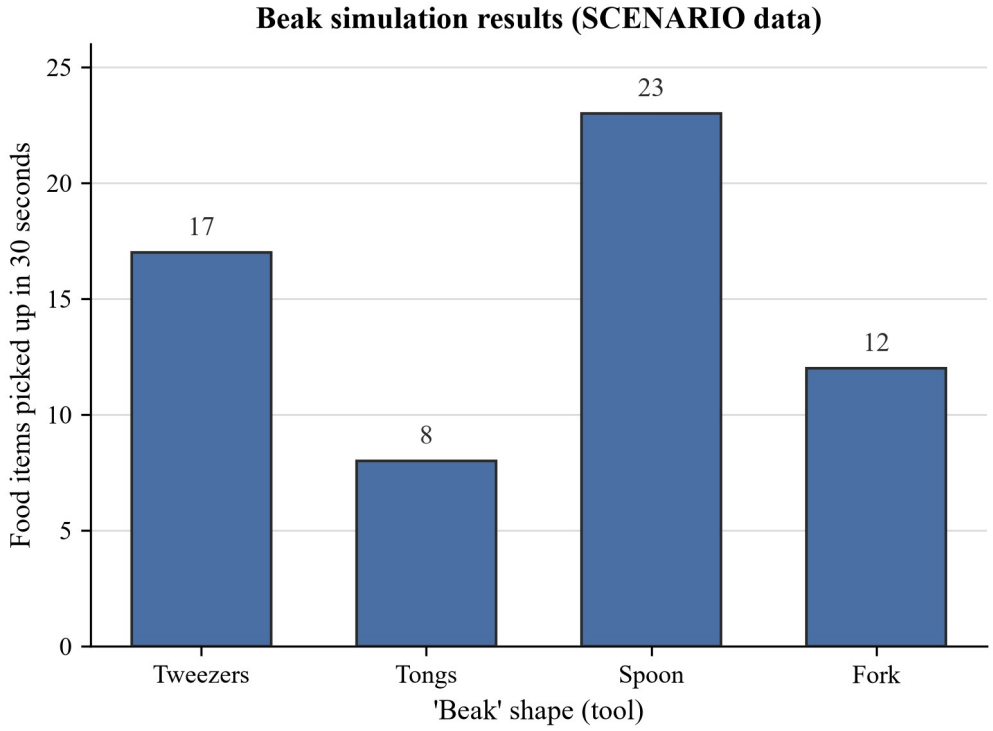
Trial	Tweezers	Tongs	Spoon	Fork
1	16	8	23	12
2	17	8	22	11
3	16	9	23	4

(a) Describe the pattern in the results: which tool collected the most beads, and which the fewest? *(2 marks)*

(b) One reading does not fit the others. Which one, and what is one thing that might have gone wrong in that trial? *(1 mark)*

(c) Why does the class do three trials for each tool instead of one? *(1 mark)*

Q13. The column graph shows the results of another beak simulation with the same four tools and the same round beads.



Column graph of beak simulation results, labelled SCENARIO data: tweezers picked up 17 food items in 30 seconds, tongs 8, spoon 23, fork 12.

(a) Read the values for the spoon and for the tongs. *(1 mark)*

(b) Which beak shape was best suited to this food? *(1 mark)*

(c) Predict which tool would do better than the spoon if the food were flat paper flakes instead of round beads, and give your reason. *(1 mark)*

Q14. In 1935, cane toads were released in north Queensland. Scientists have measured the toads ever since, and the toads at the front edge of the spread now have longer legs, big bodies and faster movement than the toads of 1935 — but the fastest toads are the most likely to develop sore, damaged joints. *(4 marks)* (a) What has changed in the front-line toads over time? (b) Is this change known from fossils or from scientific records? Explain. (c) Give one advantage of the longer legs. (d) Give one disadvantage of the longer legs.

Q15. Two young giraffes are born in the same season: one with a shorter neck, one with a longer neck. *(3 marks)* (a) What is the word for this difference between members of the same family? (b) Give one way a longer neck could help a giraffe get food. (c) Fossils show that the ancestors of modern giraffes had shorter necks. What does this tell us about organisms over time?

Q16. The eastern pygmy possum has a body only 7–11 cm long and a mass of 15–43 g. It feeds at night on nectar and pollen from flowers. In winter, nights are cold and flowers are scarce; the possum curls up in a hollow and enters torpor until flowers return. *(5 marks)* (a) Name the two measurements in the first sentence that show how small the possum is. *(1 mark)* (b) Give one structural feature and one behaviour from the text that help the possum survive. *(2 marks)* (c) Explain how torpor helps the possum get through a winter with few flowers. *(2 marks)*

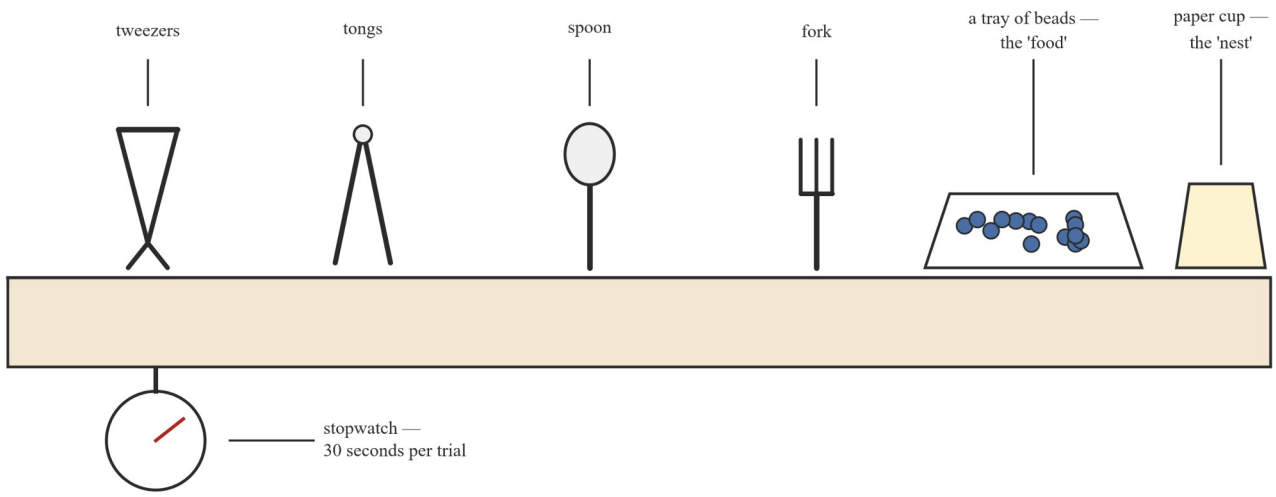
Practical — which beak shape works best?

PRACTICAL — this page plans or analyses work done in the classroom, laboratory or field. It is not a substitute for doing it.

Question: How does the shape of a “beak” change how much food it can collect in 30 seconds?

Equipment: one set of four tools — tweezers, tongs, spoon, fork (the “beaks”); a tray of beads (the “food”); a paper cup (the “nest”); a stopwatch; a results table.

The beak simulation — tools stand in for beaks



The beak simulation apparatus on a bench: tweezers, tongs, a spoon and a fork stand in for beaks; a tray of beads is the food; a paper cup is the nest; a stopwatch times 30 seconds per trial.

Safety: Beads are not food — they must never go near anyone's mouth, and dropped beads must be picked up straight away so nobody slips or steps on them. Work calmly in your own space, one hand per trial.

Risk	How we stay safe
Beads going near a mouth	Beads are not food; no beads near mouths; count them back into the tray at the end.
Beads dropped on the floor	Pick them up straight away; wipe the bench and floor down.
Rushing and bumping into others	One student works at a time; the rest watch and record.

The fair test (the things we change, measure and keep the same):

Thing	Choice
The one we change	the "beak" shape: tweezers, tongs, spoon or fork
The one we measure	the number of beads picked up in 30 seconds
The ones we keep the same	the same tray of beads; the same 30 seconds; the same hand; the same paper cup

Method:

1. Spread the beads out across the tray and put the paper cup beside it.
2. Student 1 takes the tweezers. On "go", the tweezers pick up beads, one at a time, and place them in the cup. The stopwatch runs for 30 seconds.
3. When time is called, count the beads in the cup and record the number.
4. Tip the beads back into the tray and spread them out.
5. Repeat steps 2–4 until you have three trials with the tweezers.
6. Repeat the whole process with the tongs, then the spoon, then the fork.

Results: record your counts in a table like this one.

Trial	Tweezers	Tongs	Spoon	Fork
1				

Trial	Tweezers	Tongs	Spoon	Fork
2				
3				

Compare your three trials for each beak. Do the readings agree with each other? If one reading does not fit the other two, think about what might have happened in that trial.

Graph it: draw a column graph of your results. Put the four beak shapes along the bottom and draw three columns above each one — one column per trial — so a reader can see whether your trials agree.

Thinking about the results:

1. Which beak shape collected the most beads? What is it about that shape that suits round beads?
2. Which beak shape collected the fewest? Why did that shape struggle?
3. The food was round beads. If the food were flat paper flakes, predict which beak shape would do best, and give your reason.
4. In this simulation, what is standing in for: the bird's body? the food in the environment? the time a bird gets to feed?

Make a claim and defend it. Finish this writing frame in full sentences:

- I claim that the _____ beak shape is best at collecting round beads.
- My evidence is _____ .
- This shape works well because _____ .
- If the food changed to flat flakes, I predict _____ , because _____ .

Answers

Q1 (a) A fossil is the preserved remains of a living thing from long ago, found in rock. (b) A behaviour is something an organism does — the way it acts. (c) Variation is the difference between members of the same family. **Q2** Fossils (for example *Diprotodon* or the Dinosaur Cove dinosaurs) and scientific records (for example the measured change in cane toads' legs). **Q3** (a) A body part, or the shape of one. (b) Any one: the hard ridge on its foot; its water-storing body; its cocoon of shed skin. (c) Digging down underground and waiting (or staying underground for years). **Q4** (a) The cockatoo. (b) The Pacific black duck. (c) The long thin beak reaches down into a flower to drink the nectar inside. **Q5** (a) Active at night and resting by day. (b) The animal avoids the heat of the day by staying in its cool burrow, and feeds when it is cool. (c) Large eyes, which gather dim light. **Q6** (a) It tears meat with ease. (b) It cannot sip nectar or strain food from water. (c) An adaptation. **Q7** (a) Extinct. (b) Organisms have changed over time — a large relative of wombats and koalas once lived in Victoria and is now gone. **Q8** (a) About 106 million years old. (b) It had very large eyes. (c) Large eyes gather more light, so it could see and find food during the months of darkness. **Q9** (a) The huge bottle-shaped trunk that stores water. (b) Less water is lost without leaves, so the stored water lasts the dry season. (c) A behaviour — it is something the tree does, not a body part. **Q10** (a) Predators cannot see it, so it is not eaten. (b) Prey cannot see it, so it can wait hidden and catch them. (c) A behaviour — staying still is something the animal does; the colour and shape are the structural part. **Q11** (a) It falls a lot. (b) They become much slower. (c) With a slow heartbeat and breathing it uses very little energy, so it can live on its stored energy until flowers return. **Q12** (a) The spoon collected the most (22–23) and the tongs the fewest (8–9). (b) Fork trial 3 (4 beads) — for example, beads were dropped, or the timer started late. (c) Three trials show whether a result can be trusted; one trial might be a one-off. **Q13** (a) Spoon 23; tongs 8. (b) The spoon shape. (c) The tweezers (or tongs) — a pinching shape can pick flat flakes up, while a spoon's bowl is made for scooping round things. **Q14** (a) Longer legs, big bodies, faster movement. (b) Scientific records — the change was measured in living toads over years, not read from fossils. (c) Faster travel to new food and water. (d) The fastest toads are the most likely to develop sore, damaged joints. **Q15** (a) Variation. (b) A longer neck reaches leaves higher up that shorter necks cannot reach. (c) Organisms have changed over time. **Q16** (a) Body length (7–11 cm) and mass (15–43 g). (b) Structural: its small body (any sensible body feature from the text is accepted); behaviour: feeding at night, or curling up in a hollow and entering torpor. (c) In torpor its body slows down and uses little energy, so it does not need food it cannot find, and it survives until flowers return.

Worked solutions

Q1 *(3 marks: 1 each)* (a) A fossil is the preserved remains or trace of a living thing from long ago, usually found in rock. *1 mark* (b) A behaviour is something an organism does — the way it acts, such as being active at night. *1 mark* (c) Variation is the difference between members of the same family — offspring are not exact copies of their parents. *1 mark*

Q2 *(3 marks: 1 for each kind, 1 for a correct pair of examples)* Fossils — for example *Diprotodon* fossils in Victoria or the Dinosaur Cove dinosaurs. *1 mark* Scientific records — for example the scientists' measurements showing cane toads' legs getting longer since 1935. *1 mark* One clear example given for each. *1 mark*

Q3 *(3 marks: 1 each)* (a) A structural feature is a body part of an organism, or the shape of one. *1 mark* (b) Any one: the hard ridge on its foot that digs; its body that stores water; the cocoon of shed skin that keeps water in. *1 mark* (c) It digs down underground and waits there through the dry months (or: it stays underground for up to five years). *1 mark*

Q4 *(3 marks: 1 each)* (a) The cockatoo — its strong curved beak cracks hard seeds and nuts. *1 mark* (b) The Pacific black duck — its flat bill strains small food out of water. *1 mark* (c) The long thin beak can reach down inside a flower to drink the nectar that a thick beak could not reach. *1 mark*

Q5 *(3 marks: 1 each)* (a) Nocturnal means active at night and resting during the day. *1 mark* (b) By day the desert is dangerously hot, so the animal sleeps in its cool burrow and feeds at night when it is cool — it avoids the heat and loses less water. *1 mark* (c) Large eyes, which gather the little light there is at night. *1 mark*

Q6 *(3 marks: 1 each)* (a) The hooked beak tears meat with ease, so the eagle can feed on the animals it catches. *1 mark* (b) It is the wrong shape to sip nectar or strain small food from water, so some foods are closed to the eagle. *1 mark* (c) An adaptation. *1 mark*

Q7 *(2 marks)* (a) Extinct — died out, with not one left alive. *1 mark* (b) Organisms have changed over time: a marsupial as big as a person lived in Victoria long ago, and its relatives alive today (wombats and koalas) are tiny next to it. *1 mark*

Q8 *(3 marks)* (a) About 106 million years old. *1 mark* (b) The large eye sockets are evidence that the dinosaur had very large eyes, like animals today that see in dim light. *1 mark* (c) At that time the land was inside the Antarctic Circle and dark for months each year; large eyes gather more light, so the dinosaur could still see and find food in the long darkness. *1 mark*

Q9 *(3 marks)* (a) The huge, bottle-shaped trunk, which stores water — the largest boabs hold more than 100,000 litres. *1 mark* (b) Leaves lose water, so with no leaves in the dry season the boab loses less water and its stored water lasts. *1 mark* (c) A behaviour — dropping leaves is something the tree does as the seasons change; a structural feature is a body part, like the trunk itself. *1 mark*

Q10 *(3 marks)* (a) The prey animal's colour and shape match its surroundings, so predators look right past it and it is not eaten. *1 mark* (b) A camouflaged predator is hard to see too, so it can wait hidden and ambush prey that come close. *1 mark* (c) A behaviour. Staying still is something the animal does; the matching colour and shape are the structural part, and the behaviour makes the hiding work. *1 mark*

Q11 *(3 marks)* (a) Its body temperature falls a lot. *1 mark* (b) Its heartbeat and breathing become much slower. *1 mark* (c) With everything slowed down, the possum uses very little energy, so it can survive on stored energy through weeks when cold weather means there is little food to find. *1 mark*

Q12 *(4 marks)* (a) The spoon collected the most beads (23, 22, 23) and the tongs the fewest (8, 8, 9). *1 mark* The pattern holds in every matching trial, so it is a real pattern, not a one-off. *1 mark* (b) The fork's trial 3 (4 beads) does not fit its other trials (12 and 11). *0.5 mark* A sensible reason, e.g. beads were dropped on the way to the cup, or the stopwatch started before the student was ready. *0.5 mark* (c) Three trials let you check whether readings agree; if they agree, the result can be trusted, and a strange single trial is spotted instead of being believed. *1 mark*

Q13 *(3 marks)* (a) Spoon: 23 items; tongs: 8 items. *1 mark* (b) The spoon shape — its bowl scoops up round beads quickly. *1 mark* (c) The tweezers (or the tongs): a pinching shape can grip a flat flake from above, while a spoon's bowl is made for scooping round things, not gripping flat ones. *1 mark*

Q14 *(4 marks)* (a) The front-line toads have longer legs, big bodies and faster movement than the toads of 1935. *1 mark* (b) Scientific records. *0.5 mark* The change was measured in living toads, year after year, since 1935 — it was observed directly, not read out of rock. *0.5 mark* (c) Longer legs carry a toad further and faster, so it reaches new food and water ahead of the others. *1 mark* (d) The long legs strain the body: the fastest toads are the most likely to develop sore, damaged joints. *1 mark*

Q15 *(3 marks)* (a) Variation. *1 mark* (b) A longer neck reaches leaves higher in the trees that shorter-necked giraffes cannot reach, so that giraffe has food others cannot get. *1 mark* (c) That organisms have changed over time — the neck of the giraffe family has become longer across the generations, and the fossils are the evidence. *1 mark*

Q16 *(5 marks)* (a) Its body length (7–11 cm) and its mass (15–43 g). *1 mark* (b) Behaviour: it feeds at night, or it curls up in a hollow and enters torpor. *1 mark* Structural feature: its small body — the text gives a body only 7–11 cm long and a mass of 15–43 g. Accept any sensible body feature drawn from the text. *1 mark* (c) In torpor the possum's body temperature falls and its heartbeat and breathing slow, so it uses very little energy. *1 mark* With few flowers there is little food, and the slowed body needs so little that the possum survives on its stores until flowers return. *1 mark*

Test

Topic 2 test — Biological sciences · Chapter 6 · Subtopics 6A and 6B

> This is a school-designed paper. It is not a VCAA instrument. Achievement at Levels 5 and 6 is reported against the Victorian Curriculum achievement standard on teacher judgement; the marks here are one source of evidence towards that judgement.

About this test

Covers	Chapter 6 — subtopics 6A and 6B
Content descriptions	`VC2S6U01` (6A) · `VC2S6U02` (6B)
Total marks	**30** — Section A 12 marks, Section B 12 marks, Section C 6 marks
Inquiry marks	**11 of 30** — inquiry is examined in its own right (paper minimum: 8)
Suggested time	35 minutes

How to run this test

- No calculator. No formula sheet. No reading time.
- **Untimed completion** — the suggested time is a guide only. A student may take all the time they need.
- **Reading support** — any item may be read aloud to a student who asks. Reading is not being assessed.
- Answer every question in the spaces provided.

Section A — Multiple choice — 12 marks

Choose the best answer for each question. Each question is worth 1 mark.

Q1. Which is a physical condition of a habitat? *(1 mark)*

A. Number of trees

B. Types of animals present

C. Temperature

D. Plant species present

Q2. Two habitats differ in salinity. The organism's environment will differ in: *(1 mark)*

A. Only the temperature

B. The amount of salt in the water

C. Only the amount of sunlight

D. Nothing measurable

Q3. Why might a stream in summer differ from the same stream in winter? *(1 mark)*

A. Only the colour of the water changes

B. Nothing measurable changes between seasons

C. Only the names of the fish species change

D. Temperature, flow, and dissolved oxygen all change with the season

Q4. A plant moved from sunlight to deep shade typically: *(1 mark)*

A. Grows slower

B. Grows faster

C. Shows no change at all

D. Produces many more flowers

Q5. Increasing soil salinity beyond a plant's tolerance: *(1 mark)*

A. Helps the plant grow taller

B. Has no effect on the plant

C. Damages roots and reduces growth

D. Makes the leaves greener

Q6. Why is rapid change in physical conditions often more harmful than slow change? *(1 mark)*

A. Rapid change is always colder than slow change

B. Organisms do not have time to adjust or move away

C. Slow change cannot be sensed by living things

D. Rapid change always covers a smaller area

Q7. A nocturnal animal often has: *(1 mark)*

A. Very small ears

B. Bright daytime colours

C. Thick warm fur

D. Large eyes that work well in dim light

Q8. Cacti have spines instead of leaves to: *(1 mark)*

A. Reduce water loss in dry environments

B. Catch more sunlight to make food

C. Store extra food for winter

D. Attract insects to pollinate them

Q9. Why are both physical and behavioural adaptations important for survival? *(1 mark)*

A. Behavioural adaptations are only used by mammals

B. Physical adaptations only work in cold places

C. Each helps with a different kind of challenge an animal faces

D. Only one type is ever needed at a time

Q10. Bottle trees (boab) store water in their: *(1 mark)*

A. Leaves only

B. Trunks

C. Roots only

D. Branches

Q11. Desert animals often avoid heat by being: *(1 mark)*

A. Nocturnal (active at night)

B. Active only at midday

C. Asleep the whole year

D. Constantly running to stay cool

Q12. Why is reducing water loss the most common desert adaptation? *(1 mark)*

A. Deserts have too much rain to drink safely

B. Heat is not a problem for desert animals

C. Food is more scarce than water in deserts

D. Water is the most limited resource in deserts

Section B — Short response — 12 marks

Write your answers in the spaces provided.

Q13. A class wants to find out whether the amount of light changes how bean seedlings grow. They set up three pots with the same soil and one bean seed in each pot. One pot sits in full sun, one in shade, and one in a dark place. Every pot gets the same amount of water each day. After two weeks the class measures the height of each seedling. *(3 marks)*

(a) Which variable does the class change? *(1 mark)*

(b) Which variable does the class measure? *(1 mark)*

(c) Name one variable the class keeps the same. *(1 mark)*

Q14. SCENARIO — A group measures the height of the same seedling three times. Their readings are 12.4 cm, 12.5 cm and 15.2 cm. *(2 marks)*

(a) Which reading does not fit the other two? *(1 mark)*

(b) What should the group do next? *(1 mark)*

Q15. Two beetles from the same family live on dark soil. One beetle is pale and one is dark. A bird finds the beetles by sight. *(3 marks)*

(a) What is the word for the differences between members of the same family? *(1 mark)*

(b) Which beetle is a bird more likely to see? *(1 mark)*

(c) Over many generations, most beetles on this soil become dark. What does this show about organisms over time? *(1 mark)*

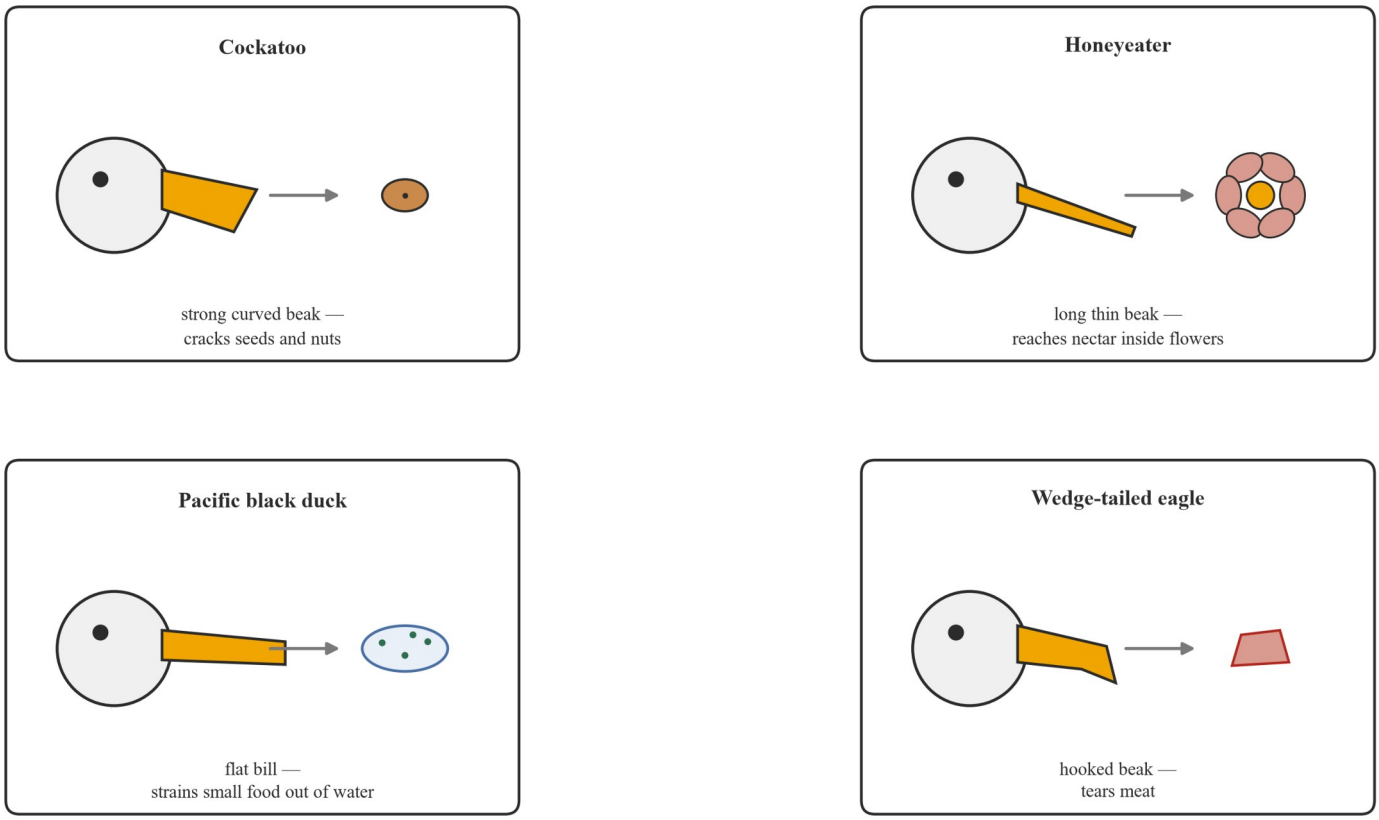
Q16. People clear a forest to make farmland. All the trees are cut down. *(2 marks)*

(a) Name one physical condition of the habitat that changes when the trees are gone. *(1 mark)*

(b) Explain how that change can affect the animals that lived in the forest. *(1 mark)*

Q17. Look at the four birds and their beaks. *(2 marks)*

Beak shapes suit the food each bird eats



Four Australian birds with beak shapes matched to their food: the cockatoo's strong curved beak cracks seeds and nuts; the honeyeater's long thin beak reaches nectar inside flowers; the Pacific black duck's flat bill strains small food out of water; the wedge-tailed eagle's hooked beak tears meat.

(a) Which bird's beak is suited to tearing meat? *(1 mark)*

(b) A bird that feeds only on hard nuts moves into this area. Predict which of the four beak shapes would suit it best, and give your reason. *(1 mark)*

Section C — Extended response — 6 marks

Q18. Use the table to answer this question. *(6 marks)*

A hive of honey bees lives in a park in Melbourne. The table shows the usual daytime high — the warmest the air usually gets in the day — for each month of the year.

Month	Usual daytime high (°C)
January	26.8
February	25.9
March	24.3
April	20.8
May	17.6
June	14.7
July	14.5
August	15.6
September	18.0
October	20.5
November	22.2
December	24.7

Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, mean monthly maximum temperature 2013–2026, bom.gov.au — retrieved 2026-08-21.

(a) From the table, what is the usual daytime high in (i) July and

(ii) February? *(2 marks)*

(b) Use the table to name the three coldest months. *(1 mark)*

(c) On cold days honey bees stay inside the hive and cannot fly out to flowers. Explain why the hive collects less food in the months you named in (b). *(1 mark)*

(d) SCENARIO — for winter, a person who keeps the bees moves the hive to a new place. Every month there is as warm as Melbourne's October. Predict how the food the hive collects through winter changes, and give your reason. *(2 marks)*

Marking guide

This guide is written so a teacher without a science background can mark the paper. Accept the student's own words wherever the meaning matches the answer given here. Spelling and grammar are not marked. Every item traces to the achievement-standard extract of 6A (VC2S6U01) or 6B (VC2S6U02) in §4.1; inquiry items also name the inquiry code they rehearse, per §4.3.

Inquiry-strand marks on this paper: 11 of 30 (Q13 × 3, Q14 × 2, Q17(b) × 1, Q18(a) × 2, Q18(b) × 1, Q18(d) × 2). The paper minimum is 8.

Section A — answers

Every multiple-choice item is drawn from the MCQ bank keyed to this band's content descriptions; the bank item id keeps the §4 join. Two items carry a one-phrase vocabulary repair, noted below; the repair changes no key and no code.

Q	Answer	CD	Bank item
1	**C** — Temperature	VC2S6U01	VC2S6U01.E01.S01.D1.V01
2	**B** — The amount of salt in the water	VC2S6U01	VC2S6U01.E01.S01.D2.V01 (repaired)
3	**D** — Temperature, flow, and dissolved oxygen all change with the season	VC2S6U01	VC2S6U01.E01.S01.D3.V01
4	**A** — Grows slower	VC2S6U01	VC2S6U01.E02.S01.D1.V01
5	**C** — Damages roots and reduces growth	VC2S6U01	VC2S6U01.E02.S01.D2.V01
6	**B** — Organisms do not have time to adjust or move away	VC2S6U01	VC2S6U01.E02.S01.D3.V01
7	**D** — Large eyes that work well in dim light	VC2S6U02	VC2S6U02.E01.S01.D1.V01
8	**A** — Reduce water loss in dry environments	VC2S6U02	VC2S6U02.E01.S01.D2.V01 (repaired)
9	**C** — Each helps with a different kind of challenge an animal faces	VC2S6U02	VC2S6U02.E01.S01.D3.V01
10	**B** — Trunks	VC2S6U02	VC2S6U02.E02.S01.D1.V01
11	**A** — Nocturnal (active at night)	VC2S6U02	VC2S6U02.E02.S01.D2.V01
12	**D** — Water is the most limited resource in deserts	VC2S6U02	VC2S6U02.E02.S01.D3.V01

Repairs. Q2: the bank's correct option reads "Water salt concentration"; it is printed as "The amount of salt in the water" because the vocabulary ladder places *concentration* above this band. Q8: the bank's distractor reads "Catch more sunlight for photosynthesis"; it is printed as "Catch more sunlight to make food" because the ladder places *photosynthesis* above this band and the book teaches the idea as "plants make their own food". Both repairs follow the word-level policy's rewrite channel; the items stay keyed to their codes.

Section B — answers and marking

Q13 *(3 marks: 1 each)* — inquiry: planning a fair test (rehearses VC2S6I02, anchored at 6A); content VC2S6U01. (a) The amount of light — accept "where each pot sits" or "sun, shade or dark". *1 mark* (b) The height of each

seedling. *1 mark* (c) Any one of: the soil; the amount of water; the kind of seed (one bean seed each); the time (two weeks). *1 mark*

Q14 *(2 marks: 1 each)* — inquiry: repeat measurements (rehearses `VC2S6I03`, anchored at 6A); content `VC2S6U01`. This book handles repeats without averaging (D16) — do not credit "find the average". (a) 15.2 cm. *1 mark* (b) Measure the seedling again — accept "repeat the measurement" or "check that reading again and keep the reading that fits". *1 mark*

Q15 *(3 marks: 1 each)* — content `VC2S6U02` (change over time, read from variation). (a) Variation. *1 mark* (b) The pale beetle. *1 mark* (c) Organisms have changed over time — accept "they have evolved" or "the form that helps survival becomes more common". *1 mark*

Q16 *(2 marks: 1 each)* — content `VC2S6U01` (human-induced change to a habitat's physical conditions). (a) Any one of: shelter; shade (light); the ground gets hotter (temperature); the ground gets drier (water); the soil can wash away. *1 mark* (b) An explanation linking the change to survival, for example: with no trees there is no shelter, so the animals cannot hide or rest; or the ground gets hotter and drier, so the animals cannot live there; or the soil washes away, so the plants the animals feed on are lost. *1 mark*

Q17 *(2 marks: 1 each)* — content `VC2S6U02`; part (b) is inquiry: a reasoned prediction (rehearses `VC2S6I01`, anchored at 6B). (a) The wedge-tailed eagle. *1 mark* (b) The cockatoo's beak — accept "the strong curved beak". *0.5 mark* The reason must suit the food: a strong curved beak cracks hard nuts, as it cracks seeds and nuts in the diagram. *0.5 mark* (If the student picks another beak, credit the prediction only if the reason genuinely fits hard nuts; "it looks strong" alone is not enough.)

Section B subtotal: 12 marks.

Section C — answers and marking

Q18 *(6 marks)* — content `VC2S6U01` (conditions and survival); parts (a), (b) and (d) are inquiry: reading a supplied data table (rehearses `VC2S6I04`) and a reasoned prediction (rehearses `VC2S6I01`). The table is real Bureau of Meteorology data for Melbourne (Olympic Park).

(a)
  (i) July: 14.5 °C. *1 mark* (ii) February: 25.9 °C. *1 mark* Both figures must come from the table and carry °C.

(b) June, July and August. *1 mark* All three months required.

(c) In those months the days are cold, so the bees stay inside the hive and cannot fly out to flowers — so less food comes into the hive. *1 mark* Accept any answer that links the cold days to bees staying in the hive and not feeding.

(d) Prediction: the hive collects more food through winter. *1 mark* Reason: every month is as warm as Melbourne's October (20.5 °C), so the days are warm enough for the bees to fly out and feed on flowers instead of staying in the hive. *1 mark* Accept a correctly reasoned prediction either way — a student who predicts "about the same" because warmth alone is not enough without flowers is creditworthy if the reason is given.

Traceability

Item	Marks	CD	Achievement-standard evidence	Inquiry
Q1–Q6	6	`VC2S6U01`	habitats described by physical conditions; changes to conditions affect growth and survival	—
Q7–Q12	6	`VC2S6U02`	structural features and behaviours enable organisms to	—

Item	Marks	CD	Achievement-standard evidence	Inquiry
			thrive	
Q13	3	VC2S6U01 + VC2S6I02	variables changed, measured and kept the same in a fair test	3
Q14	2	VC2S6U01 + VC2S6I03	repeat measurements; the reading that does not fit	2
Q15	3	VC2S6U02	examples of how organisms have changed over time	—
Q16	2	VC2S6U01	human-induced change affects survival	—
Q17	2	VC2S6U02 + VC2S6I01 (part b)	features suit organisms to their environment; reasoned prediction	1
Q18	6	VC2S6U01 + VC2S6I04/VC2S6I01 (parts a, b, d)	conditions affect survival; read and reason from real data	5
Total	**30**			**11**