Science 3–4

Chapter 5 — Earth and space sciences

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Contents

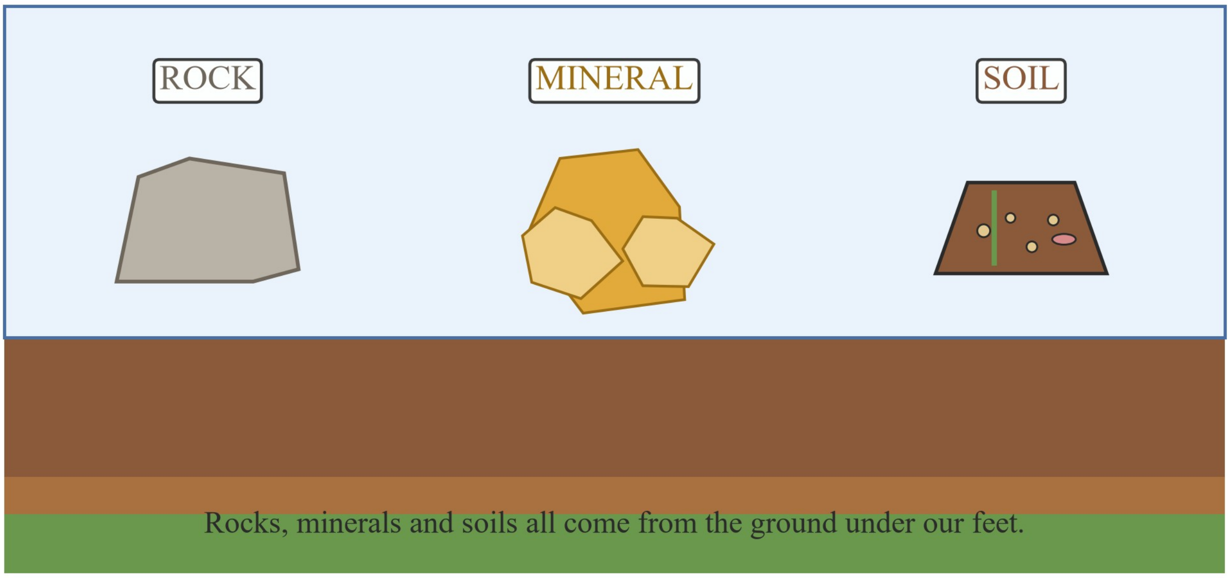
Rocks, minerals and soils as Earth resources

> **What we teach here** — `VC2S4U06` (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): "rocks, minerals and soils are important Earth resources and have observable properties that enable them to be used in a variety of ways". **In our words:** the ground under our feet is full of useful stuff. Rocks, minerals and soils are Earth resources — things from the Earth that people can use. We can observe them with our eyes and hands: how they feel, what colour they are, how big their bits are, and whether we can see their crystals. Those things decide what we use them for. The teaching ideas come from the curriculum notes `.E01`–`.E04` and `.E06` of `VC2S4U06`. `VC2S4U06.E05` is held back under the ICIP decision and is not taught here.

What you learn here

Three Earth resources

A **resource** is something people can use. Water is one Earth resource, and you met it in subtopic 5B. This subtopic is about three more: **rocks**, **minerals** and **soils**.

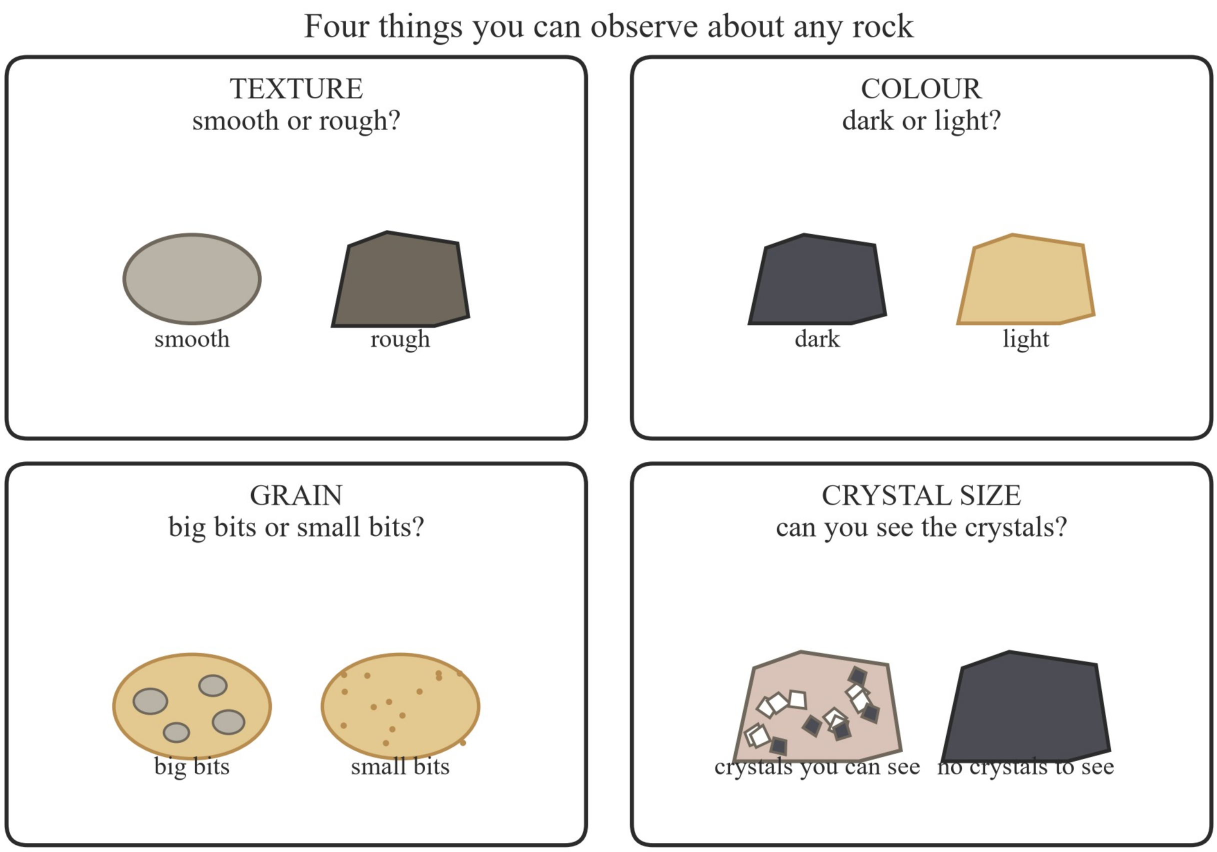


Three panels above a side view of the ground: a grey rock labelled rock, a group of gold crystals labelled mineral, and a scoop of brown soil with sand grains, a root and a worm labelled soil

A **rock** is a hard, solid lump that comes from the ground. A **mineral** is a natural solid stuff with its own colour and shine — rocks are made of minerals. **Soil** is the soft top layer of the ground where plants grow. All three come from the Earth, and all three are useful to us.

Observable properties of rocks

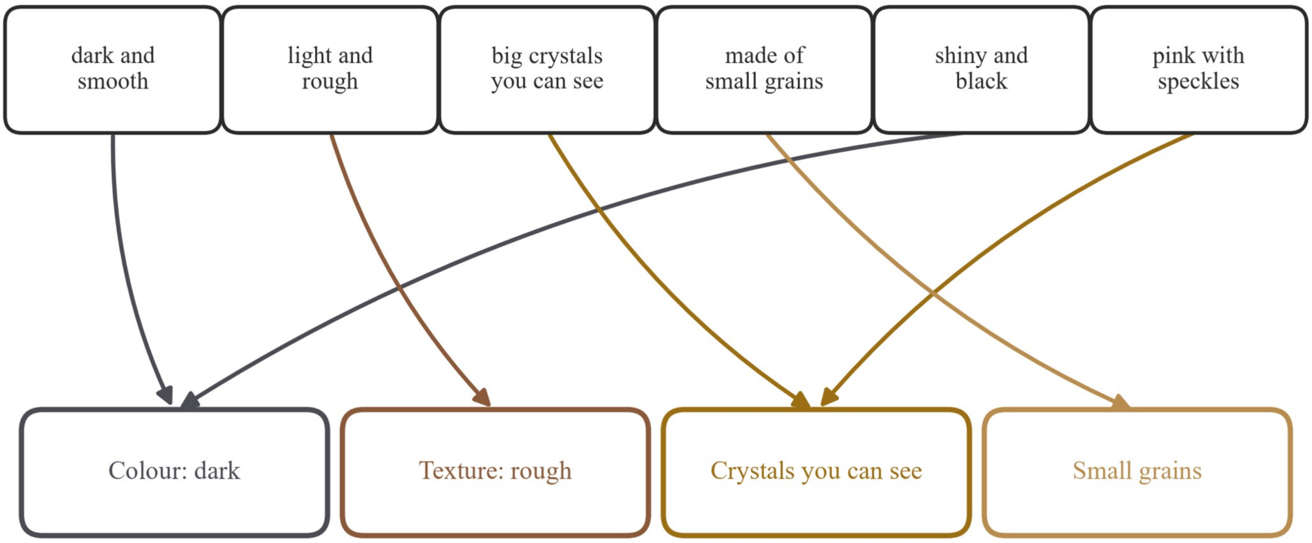
A **property** is something you can observe about a thing. You do not need any special tool to start — your eyes and hands are enough. Here are four properties we use for rocks.



Four panels showing the four observable properties of rocks: texture with a smooth round pebble and a rough jagged lump, colour with a dark lump and a light lump, grain with a lump made of big bits and a lump made of small bits, and crystal size with a speckled lump where crystals are visible and a plain lump where you cannot see any

- **Texture** — how it feels. Is it smooth or rough?
- **Colour** — is it dark or light?
- **Grain** — is it made of big bits or small bits?
- **Crystal size** — can you see the little crystals in it, or not?

Try this — sort some rocks. With your teacher, collect a few rocks from the school grounds or a local area. Look at each one with a magnifying glass. Feel it. Then sort the rocks into groups by one property, and say which property you used.



The same rock can be sorted more than one way — say which property you used.

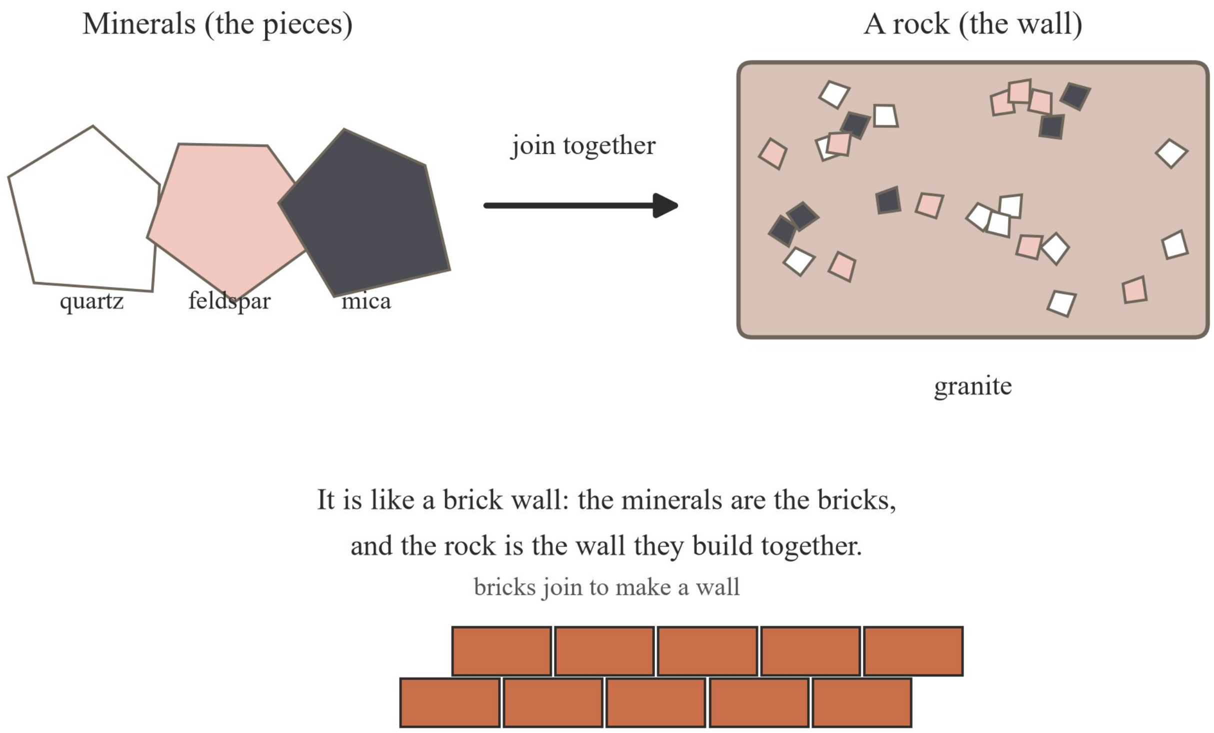
A sorting diagram: six rock descriptions across the top (dark and smooth, light and rough, big crystals you can see, made of small grains, shiny and black, pink with speckles) sorted by arrows into four groups below (Colour: dark, Texture: rough, Crystals you can see, Small grains)

The same rock can go in more than one group. A rock that is dark and smooth belongs in “Colour: dark” and could also be sorted by texture. That is why we always say which property we used to sort.

Safety: wash your hands after handling rocks and soil, and do not put them near your mouth.

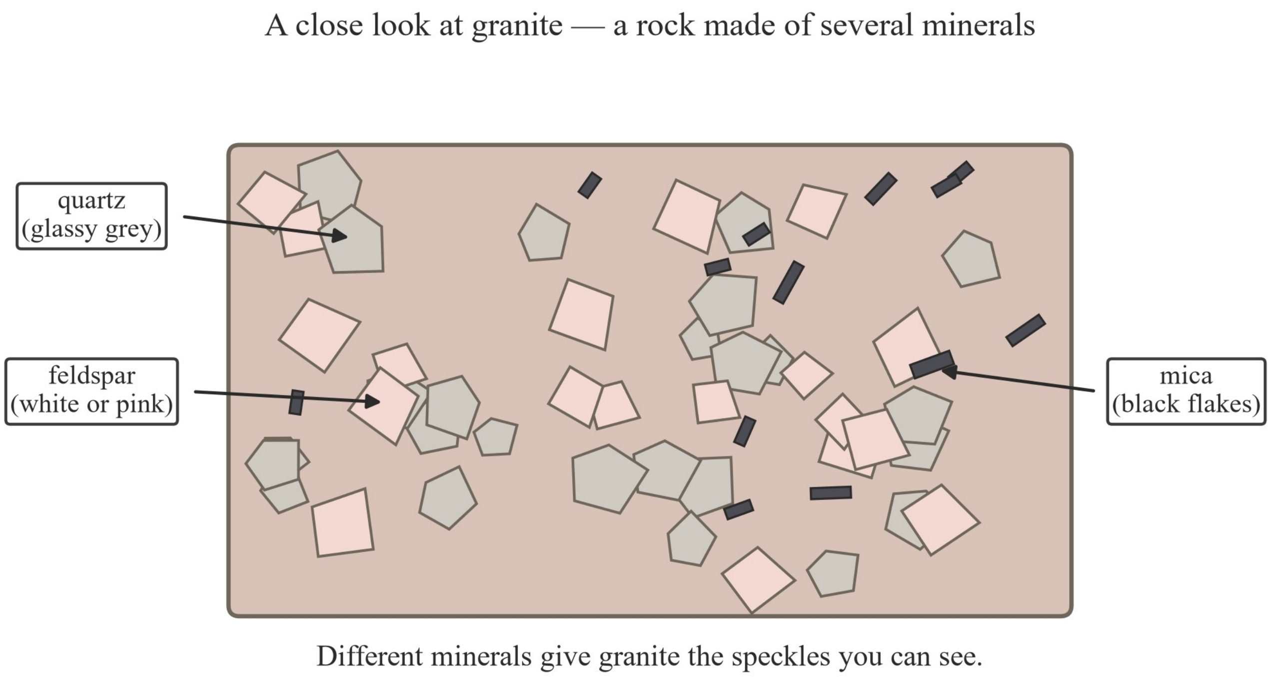
Minerals are the building blocks of rocks

Rocks are made of minerals. We say minerals are the **building blocks** of rocks, the way bricks are the building blocks of a wall.



Left: three separate mineral crystals labelled quartz, feldspar and mica; an arrow labelled join together; right: a slab of granite made of many small white, pink and black crystals, with the brick-wall idea below

One rock can hold several different minerals joined together. The minerals inside a rock decide what the rock is like — its colour, its shine and how hard it is. So two rocks can be different because they are made of different minerals.

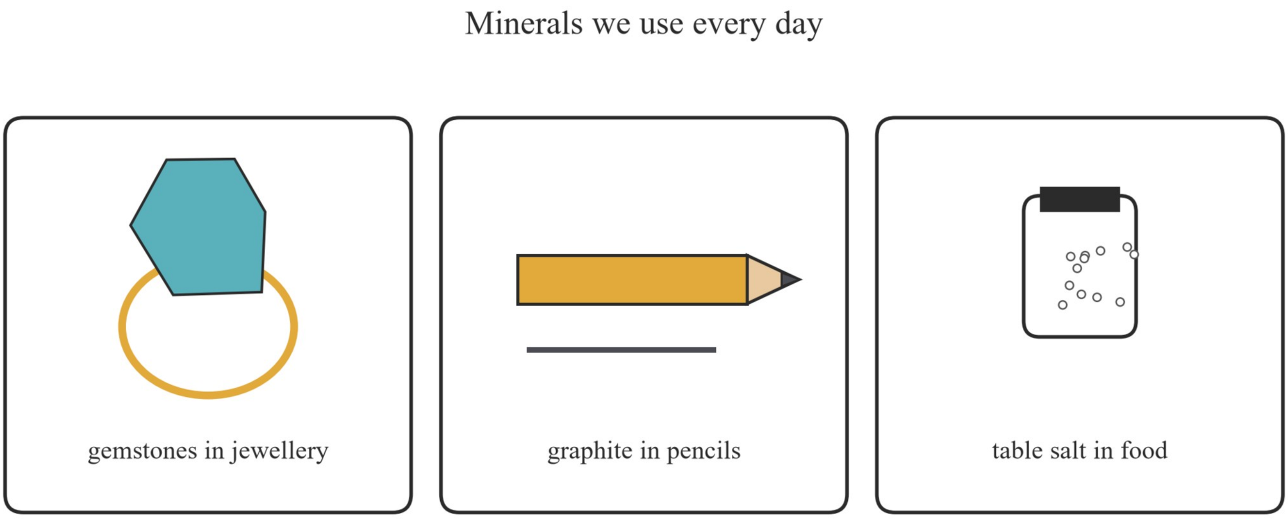


A close look at a slab of granite: many small crystals with labels pointing to quartz (glassy grey), feldspar (white or pink) and mica (black flakes)

Look at the granite in the picture. The glassy grey bits are the mineral **quartz**, the white or pink bits are **feldspar**, and the black flakes are **mica**. Three minerals, joined into one rock. That is why granite looks speckled.

What we use minerals for

Minerals are useful in everyday life.



Three panels: a ring set with a blue gemstone labelled gemstones in jewellery, a yellow pencil with a dark line it drew labelled graphite in pencils, and a small shaker of white grains labelled table salt in food

- **Gemstones** are minerals that are hard and pretty. We cut and polish them for jewellery.
- **Graphite** is a soft, dark mineral. It is the “lead” in your pencil that leaves a mark on paper.
- **Table salt** is a mineral too. We put it on food.

Rocks in built and natural environments

Rocks are key parts of both **natural environments** (hills, creeks, coastlines) and **built environments** (the things people build). In Victoria, a dark, hard rock called **bluestone** (its rock name is **basalt**) was used all over the place.

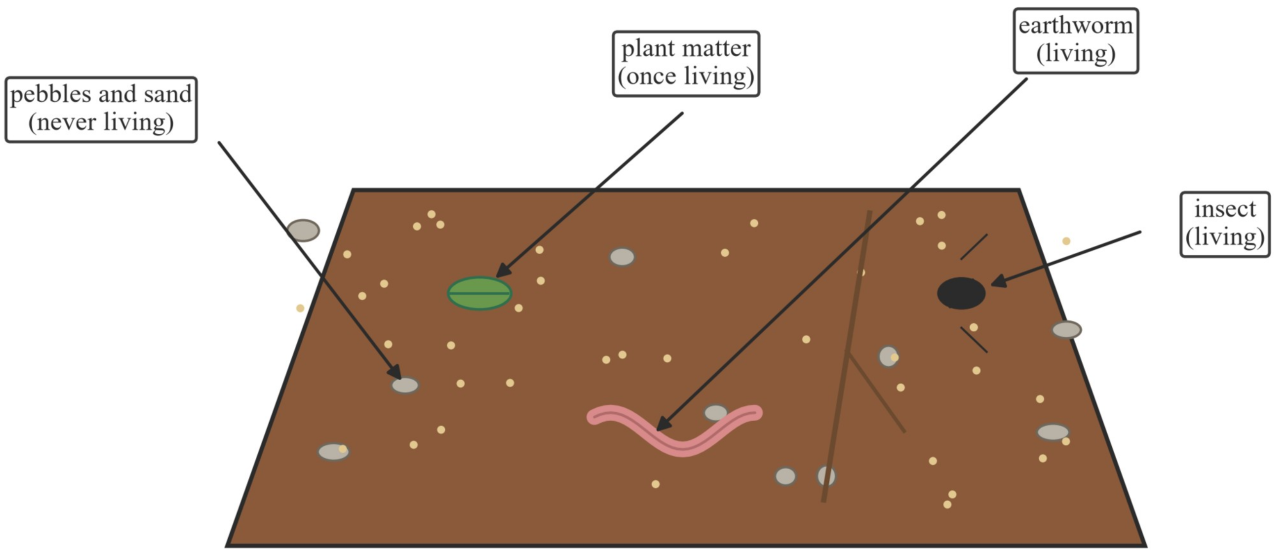
Three panels: a wall of dark bluestone blocks with a door labelled buildings, a road side view with crushed bluestone under the road surface labelled roads, and railway tracks sitting on a bed of crushed stone labelled railways

In Melbourne, old buildings and walls — like the Old Melbourne Gaol and St Patrick's Cathedral — are made of bluestone blocks. When bluestone is crushed into small pieces, we call it **blue metal**. Blue metal is used under roads and under railway tracks to keep them strong, and it is mixed into concrete. A pink rock called **granite** from Harcourt is used for statues and headstones.

What is soil made of?

Dig up a scoop of soil and have a close look with a magnifying glass. Soil is a mix of lots of things.

A close look at a scoop of soil

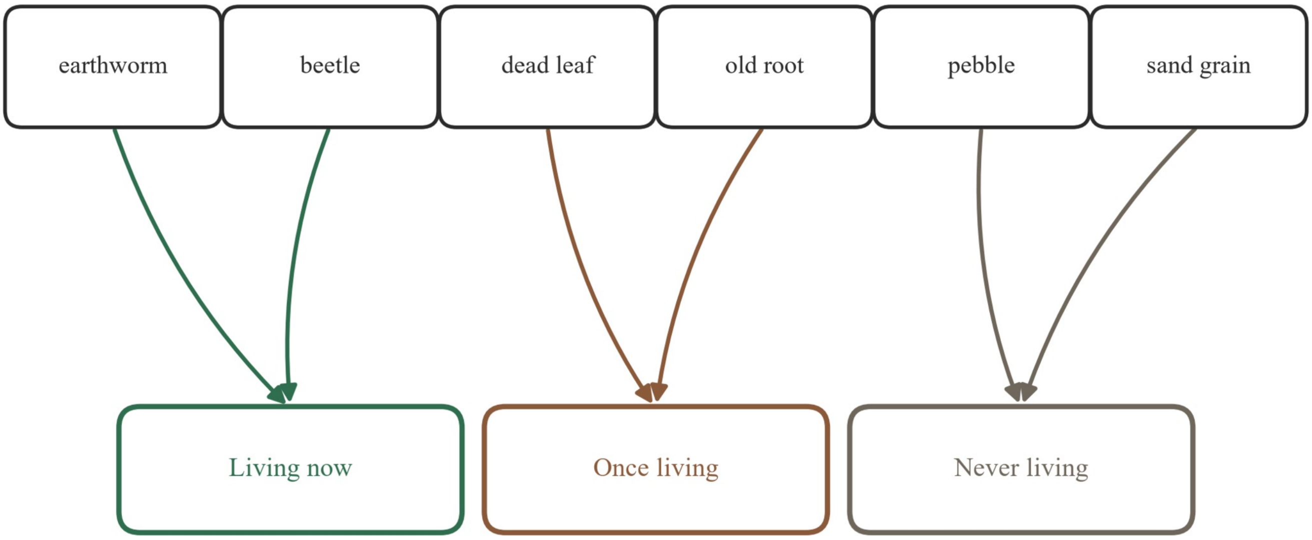


Soil has never-living bits, once-living bits and living bits.

A close look at a scoop of soil with labels: pebbles and sand (never living), plant matter (once living), earthworm (living) and insect (living)

- **Never-living bits** — pebbles, sand and tiny bits of rock.
- **Once-living bits** — old leaves and roots, called **plant matter**.
- **Living bits** — earthworms and insects that make their home in the soil.

You sorted things into living, once-living and never-living back in Level 3. Soil is a great place to use that idea again.



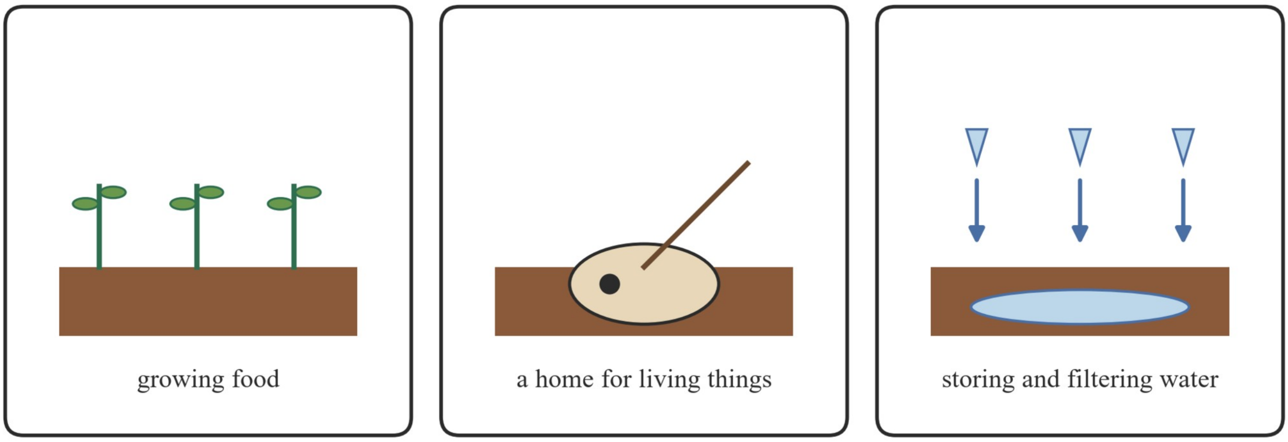
You can sort the bits of soil the same way you sorted living, once-living and never-living things in 3A.

A sorting diagram: six things found in soil across the top (earthworm, beetle, dead leaf, old root, pebble, sand grain) sorted by arrows into three groups below (Living now, Once living, Never living)

What depends on soil?

Living things — including humans — depend on soil in three big ways.

Three jobs soil do



Three panels: seedlings growing in a bed of soil labelled growing food, a burrow in the soil with an animal inside labelled a home for living things, and rain drops soaking into soil and pooling as clean water labelled storing and filtering water

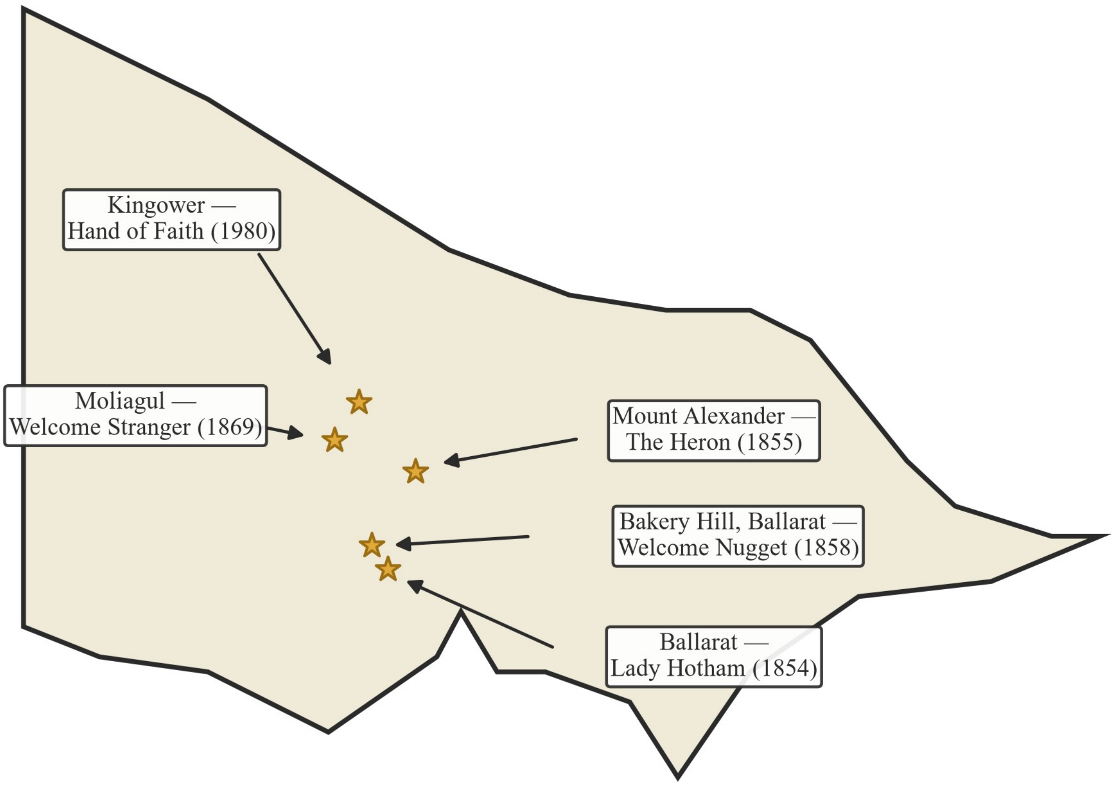
- **Food.** Plants that feed us grow in soil. Farms depend on good soil.
- **Habitats.** A **habitat** is a home for living things. Earthworms, insects and many small animals live in soil.
- **Storing and filtering water.** Soil soaks up rain like a sponge and holds it. As the water moves down through the soil, the soil **filters** it — cleans it — a little.

What do people dig out of the ground in Victoria?

Victoria is a good place to see rocks and minerals being used, because a lot is **mined** or **quarried** here. A **mine** is a place where we dig valuable things like gold or coal out of the ground. A **quarry** is a place where we dig out rock like bluestone or granite.

Gold was found in many parts of Victoria. Here is where five famous gold **nuggets** — lumps of gold picked up from the ground — were found.

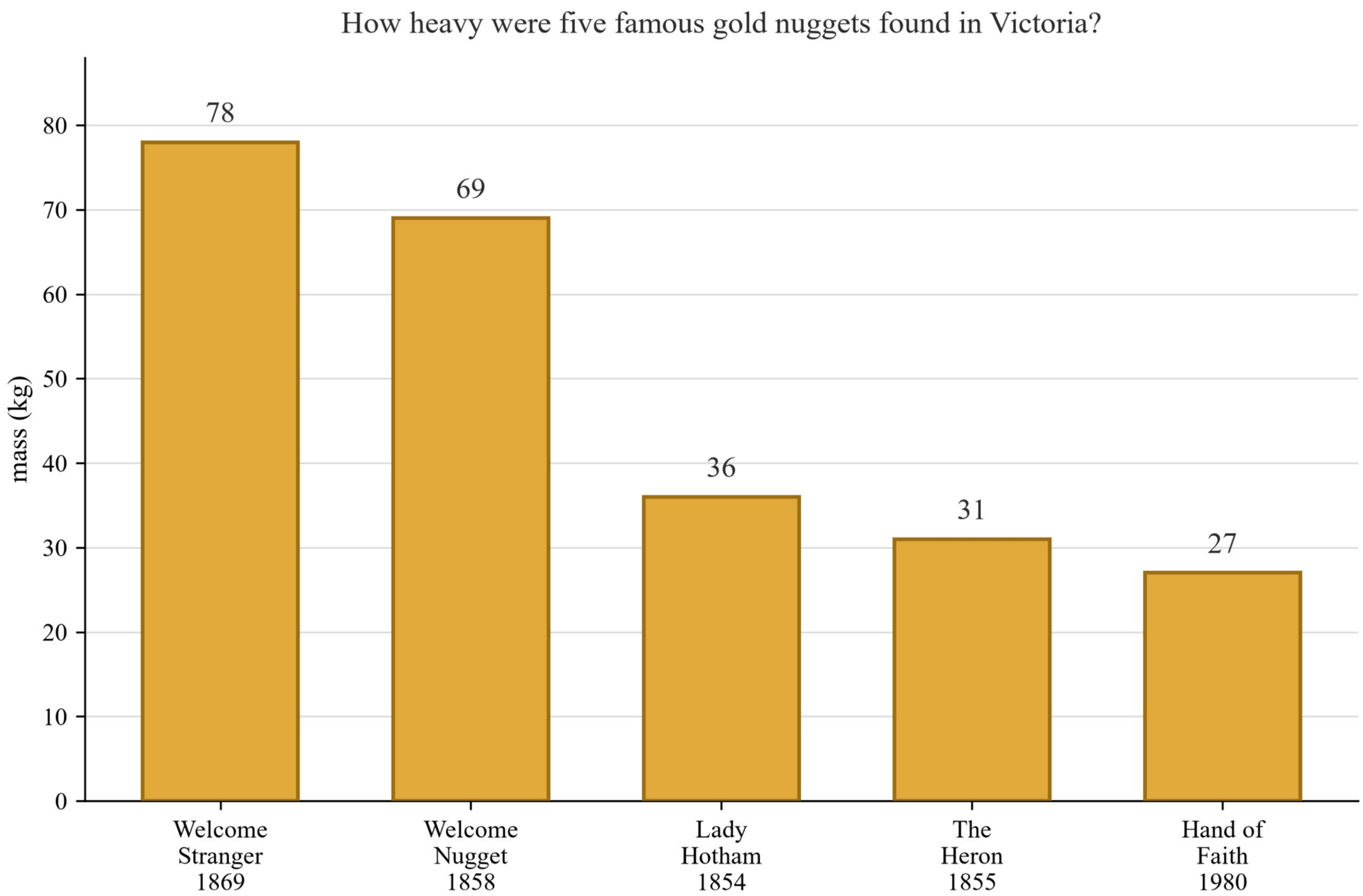
Where gold was found in Victoria



Every star is a real place where a famous gold nugget was found.

A simple map of Victoria with five gold stars and labels: Kingower (Hand of Faith, 1980), Moliagul (Welcome Stranger, 1869), Mount Alexander (The Heron, 1855), Bakery Hill Ballarat (Welcome Nugget, 1858) and Ballarat (Lady Hotham, 1854)

Here is how heavy those five nuggets were.



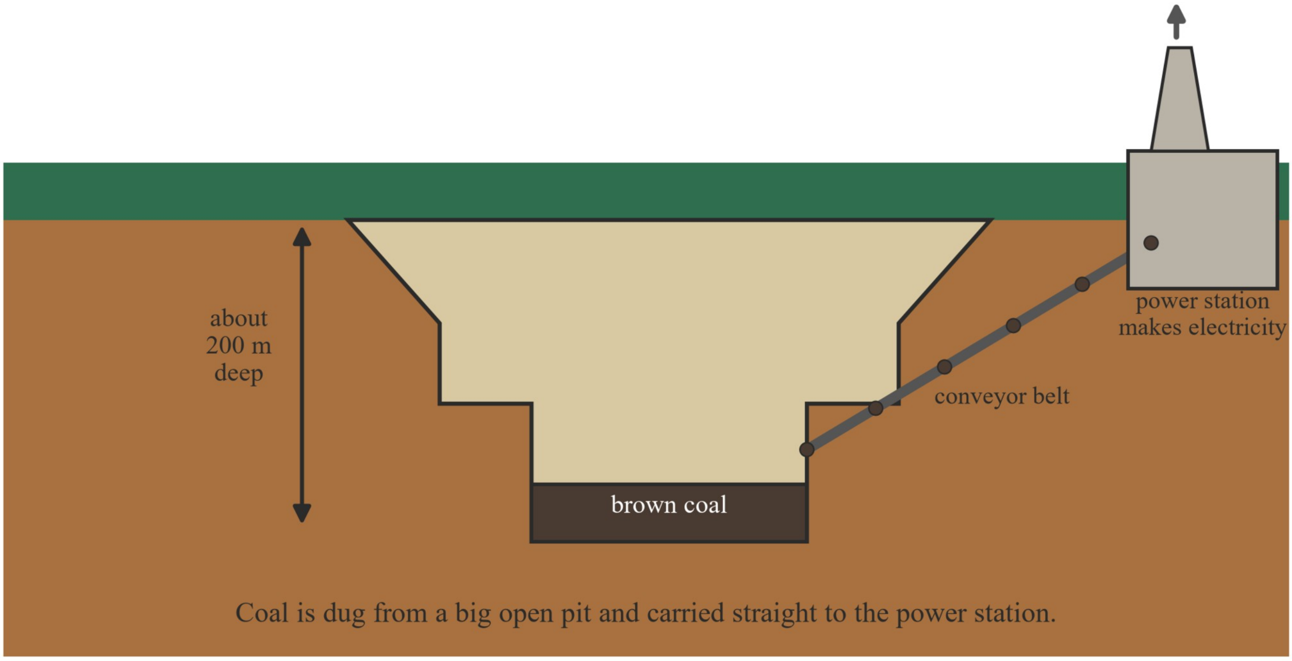
A column graph of the masses of five famous Victorian gold nuggets: Welcome Stranger 78 kg, Welcome Nugget 69 kg, Lady Hotham 36 kg, The Heron 31 kg, Hand of Faith 27 kg

Source: Wikipedia, "List of gold nuggets by size" and "Welcome Stranger" (en.wikipedia.org) — retrieved 2026-08-21. Masses rounded to the nearest whole kg.

The Welcome Stranger is the biggest gold nugget ever found. It was picked up at Moliagul in 1869. The Hand of Faith, found at Kingower in 1980, is famous for being found with a metal detector.

People dig brown coal out of a big open pit in the Latrobe Valley, east of Melbourne.

An open-cut brown coal mine in the Latrobe Valley (Loy Yang)



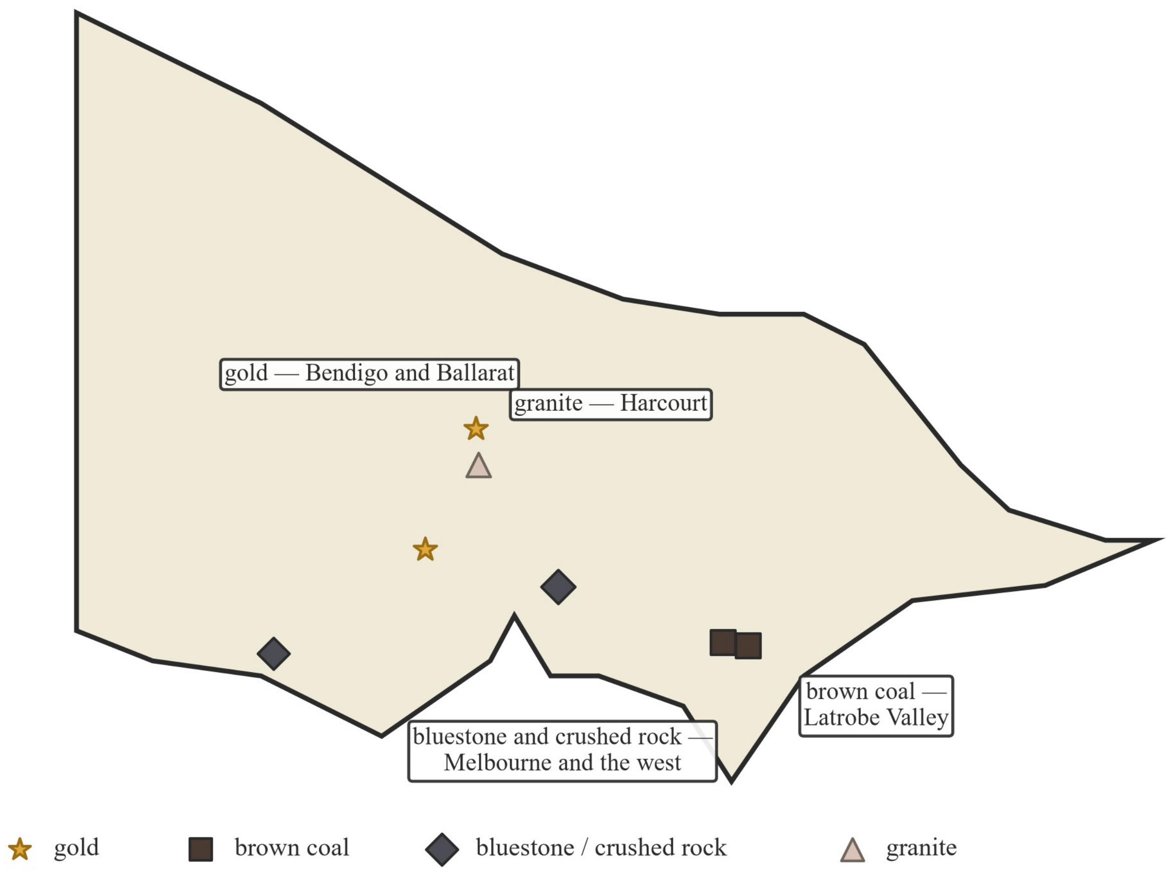
A side view of a brown coal mine: a stepped open pit about 200 m deep with a seam of brown coal at the bottom, a conveyor belt carrying coal up to a power station that makes electricity

Source: Wikipedia, “Loy Yang power station” (en.wikipedia.org) — retrieved 2026-08-21.

At Loy Yang, the pit is about 200 m deep and about 3 km long. People dig out a huge amount of brown coal each year. A conveyor belt carries the coal straight to a power station, where it is used to make electricity — the power that runs lights, heaters and machines.

Here is a map of what people dig out of the ground across Victoria.

What is dug out of the ground in Victoria



A simple map of Victoria with a legend: gold stars at Bendigo and Ballarat, brown-coal squares in the Latrobe Valley, bluestone and crushed-rock diamonds at Melbourne and the western plains, and a granite triangle at Harcourt

Source: Wikipedia, "Bluestone", "Harcourt, Victoria" and "Loy Yang power station" (en.wikipedia.org) — retrieved 2026-08-21.

Gold goes to jewellery and coins. Bluestone and crushed rock go to buildings, roads and railways. Granite goes to statues and headstones. Brown coal goes to making electricity. In every case, it is the properties of the rock or mineral — how hard it is, what it looks like, what it does — that make it useful for that job.

Worked examples

Example 1 — with help. Match each observation to the property it is about. Choose from: *texture, colour, grain, crystal size*.

(a) "It feels rough, like sandpaper."
(b) "It is dark grey, almost black."
(c) "I can see little shiny crystals in it."
(d) "It is made of lots of small bits stuck together."

Working	Comment
(a) Rough or smooth is how a rock feels.	That is **texture**.
(b) Dark or light is what we see with our eyes.	That is **colour**.
(c) Seeing little crystals is about crystal size.	That is **crystal size**.
(d) Big bits or small bits is about grain.	That is **grain**.

Example 2 — with help. Granite is made of three minerals: quartz, feldspar and mica. (a) Which one is the rock, and which three are the minerals? (b) What is the name for the part minerals play in a rock? (c) Why does granite look speckled?

(a) **Granite** is the rock; **quartz, feldspar and mica** are the minerals in it.
(b) Minerals are the **building blocks** of the rock — like bricks in a wall.
(c) The three minerals have different colours (grey, white/pink, black), so the joined rock looks speckled.

∴ A rock is made of minerals joined together, and the minerals give the rock its looks.

Example 3 — with help. Use the nugget column graph. (a) Which nugget was the heaviest? (b) Which was the lightest? (c) How many kg heavier was the heaviest than the lightest?

(a) The tallest column is the **Welcome Stranger** (78 kg). (b) The shortest column is the **Hand of Faith** (27 kg). (c) Subtract: 78 − 27 = **51**.

∴ The Welcome Stranger was the heaviest, and it was 51 kg heavier than the Hand of Faith.

Example 4 — with help. Sort these into mine or quarry: (a) digging gold at Ballarat; (b) digging bluestone for a road; (c) digging brown coal at Loy Yang; (d) digging granite for a headstone.

Working	Comment
(a) Gold is a valuable mineral people dig from the ground.	A **mine**.
(b) Bluestone is a rock people dig out to use in building.	A **quarry**.
(c) People dig coal out to burn for electricity.	A **mine**.
(d) Granite is a rock people dig out for building and statues.	A **quarry**.

Practice questions

With help

Q1. Name the three Earth resources this subtopic is about.

Q2. Fill in the gaps. (a) A ______ is something you can observe about a thing. (b) The soft top layer of the ground where plants grow is called ______.

Q3. Name the four observable properties of rocks we used in this subtopic.

Q4. Match each mineral to its use: *gemstone, graphite, table salt*. (i) the “lead” in a pencil; (ii) cut and polished for jewellery; (iii) put on food.

Q5. Look at the granite picture. Name the three minerals in granite and say what each one looks like.

Q6. Name two things soil has that are (a) never living, (b) once living, (c) living.

Q7. Give the three big ways living things depend on soil.

Q8. True or false: the same rock can be sorted into more than one group, depending on which property you use.

On your own

Q9. Minerals are called the building blocks of rocks. Explain what that means, using the brick-wall idea.

Q10. A classmate says a rock and a mineral are the same thing. Use granite to explain why they are not.

Q11. Look at the nugget column graph. (a) Which two nuggets were found at Ballarat? (b) How many kg heavier was the Welcome Nugget than the Lady Hotham? (c) Which nugget was found with a metal detector, and where?

Q12. Look at the coal mine picture. (a) About how deep is the pit at Loy Yang? (b) What carries the coal from the pit to the power station? (c) What is the coal used for?

Q13. Bluestone is used in Victoria for buildings, roads and railways. For each, say whether the bluestone is used as blocks or crushed into blue metal.

Q14. A farmer says good soil matters for the farm. Use what soil does to explain why.

Q15. Look at the map of what people dig out of the ground in Victoria. Name one place for gold, one place for brown coal, and one place for granite, and say what each resource is used for.

Q16. You find a lump in the school grounds. Describe how you would observe its texture, colour, grain and crystal size, and say how those properties could help you decide what it might be used for.

Answers

Q1. Rocks, minerals and soils.

Q2. (a) property; (b) soil.

Q3. Texture, colour, grain and crystal size.

Q4. (i) graphite; (ii) gemstone; (iii) table salt.

Q5. Quartz (glassy grey), feldspar (white or pink) and mica (black flakes).

Q6. (a) pebbles and sand; (b) dead leaves and roots (plant matter); (c) earthworms and insects.

Q7. Growing food, providing habitats (homes), and storing and filtering water.

Q8. True.

Q9. Minerals join together to make a rock, the way bricks join together to make a wall. Each mineral is one “brick”; the rock is the whole “wall”.

Q10. Granite is a rock, but it is made of three minerals (quartz, feldspar and mica) joined together. So a rock can hold more than one mineral — they are not the same thing.

Q11. (a) The Welcome Nugget and the Lady Hotham; (b) $69 - 36 = 33$ kg; (c) the Hand of Faith, at Kingower.

Q12. (a) About 200 m; (b) a conveyor belt; (c) to make electricity.

Q13. Buildings: blocks. Roads: crushed blue metal. Railways: crushed blue metal.

Q14. Plants that feed us grow in soil, so the farm needs good soil to grow food; soil also stores and filters water for the plants and gives a habitat to living things that help the soil.

Q15. Gold: Ballarat or Bendigo — jewellery and coins. Brown coal: Latrobe Valley — electricity. Granite: Harcourt — statues and headstones.

Q16. Feel it for texture (smooth or rough), look at it for colour (dark or light), have a close look with a magnifying glass for grain (big or small bits) and crystal size (crystals you can see or not). Then match the properties to a use — a hard, good-looking rock might be used for building, a soft dark one might mark like graphite.

Worked answers

Q1. The subtopic title and first picture name the three: **rocks, minerals and soils**. All three come from the ground under our feet, and all three are useful.

Q2. (a) A **property** is something you can observe about a thing. (b) The soft top layer where plants grow is **soil**.

Q3. The four properties picture shows them: **texture** (smooth or rough), **colour** (dark or light), **grain** (big bits or small bits) and **crystal size** (can you see the crystals?).

Q4. (i) The pencil “lead” is **graphite**. (ii) Jewellery stones are **gemstones**. (iii) The mineral on food is **table salt**.

Q5. Read the labels on the granite picture: **quartz** is glassy grey, **feldspar** is white or pink, and **mica** is black flakes.

Q6. From the soil close-look picture: (a) never living — **pebbles and sand**; (b) once living — **dead leaves and roots** (plant matter); (c) living — **earthworms and insects**.

Q7. The three-jobs picture shows them: soil **grows food**, gives a **habitat** (home) to living things, and **stores and filters water**.

Q8. True. The sorting picture puts “dark and smooth” in “Colour: dark” — but that same rock could be sorted by texture too. We always say which property we used.

Q9. Think of a brick wall. A single brick is not the wall; many bricks joined together make the wall. Minerals are like the bricks, and the rock is like the wall they build. So "building blocks" means minerals join together to make a rock.

Q10. Point to granite. Granite is one rock, but the close-look picture shows three different minerals inside it — quartz, feldspar and mica. If a rock and a mineral were the same thing, granite could only be one of them. So they are different: a rock is made of one or more minerals.

Q11. (a) The map shows two stars at Ballarat: the **Welcome Nugget** (Bakery Hill) and the **Lady Hotham**. (b) Read the graph: Welcome Nugget 69 kg, Lady Hotham 36 kg. Subtract: 69 − 36 = **33 kg**. (c) The **Hand of Faith**, found at **Kingower** with a metal detector.

Q12. (a) The depth arrow on the picture says about **200 m**. (b) A **conveyor belt** carries the coal up from the pit. (c) The coal is used at the power station to **make electricity**.

Q13. Buildings use bluestone as **blocks** (cut into lumps and stacked). Roads and railways use it **crushed** into blue metal, spread under the road surface or under the tracks to keep them strong.

Q14. Food we eat comes from plants, and plants grow in soil — so a farm depends on good soil to grow food. Soil also stores and filters water that the plants need, and it is a habitat for living things like earthworms that keep the soil healthy.

Q15. Gold at **Ballarat** (or Bendigo) goes to jewellery and coins. Brown coal in the **Latrobe Valley** goes to making electricity. Granite at **Harcourt** goes to statues and headstones.

Q16. A good answer: feel the lump to judge **texture** (smooth or rough); look at it in good light for **colour** (dark or light); have a close look, with a magnifying glass if you have one, for **grain** (big bits or small bits); and check for **crystal size** (crystals you can see or not). Then match properties to uses: hard and good-looking suits building or statues; soft and dark might mark paper like graphite. The properties tell us the use.

Words to know in 5A

Word	What it means
resource	something people can use
rock	a hard, solid lump that comes from the ground
mineral	a natural solid stuff with its own colour and shine; rocks are made of minerals
soil	the soft top layer of the ground where plants grow
property	something you can observe about a thing
texture	how a thing feels — smooth or rough
grain	the size of the bits a rock is made of — big bits or small bits
crystal	a little solid with its own shape that you can sometimes see in a rock
building blocks	the parts that join together to make a rock
gemstone	a hard, pretty mineral cut and polished for jewellery
graphite	a soft, dark mineral used as the "lead" in pencils
bluestone / basalt	a dark, hard rock used for building and crushed into blue metal
blue metal	bluestone crushed into small pieces, used under roads and railways
granite	a speckled rock made of quartz, feldspar and mica
quarry	a place where people dig out rock like bluestone or granite
mine	a place where people dig out valuable things like gold or

Word	What it means
	coal
nugget	a lump of gold picked up from the ground
habitat	a home for living things
filter	to clean water as it moves through something, like soil

Water sources and the water cycle

> **What we teach here** — `VC2S4U07` (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): "water is an important Earth resource that originates from various sources; water cycles through the environment by moving through the sky, landscape and ocean, and involves processes including precipitation, evaporation, transpiration, condensation, melting, freezing, crystallisation, infiltration and run-off". **In our words:** water is one of Earth's most important resources. It is found in many places — in the oceans, frozen as ice, on the land and under the ground — and most of it is salt water. Water is always on the move: it cycles through the sky, the landscape and the ocean, changing state as it goes, and every move it makes has a name. The teaching contexts come from the elaborations of `VC2S4U07` (`.E01` and `.E03`–`.E07`). `VC2S4U07.E02` is reserved under the ICIP decision and is not taught here.

Theory

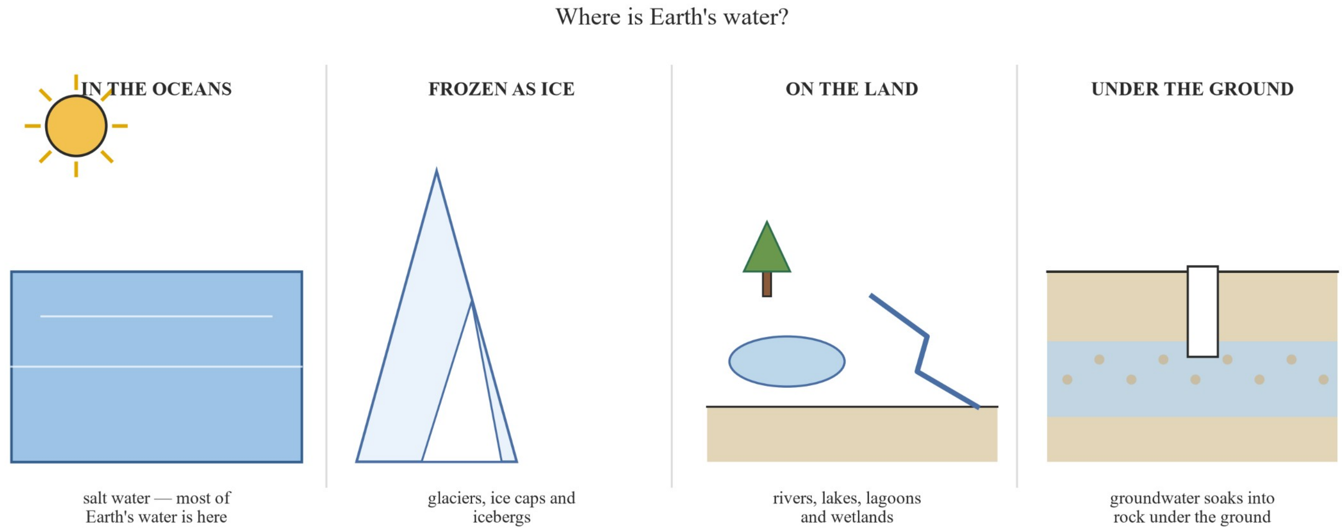
Water is a resource we use every day

A **resource** is something people can use. Water is one of Earth's most important resources. You drink it every day. You wash with it. It cooks your food, and it flushes the toilet. Farms need it to grow food, and factories need it to make things.

But the water you use today is not new. It is the same water that has been on Earth for a very long time, moving around and around. To see how that works, we first need to know where Earth's water is.

Where is Earth's water?

Earth's water is found in four main places.



Water is found in four main places. Most of it is salt water in the oceans.

Four panels showing where Earth's water is found: the oceans full of salt water, water frozen as ice in glaciers and ice caps, fresh water on the land in rivers and lakes, and groundwater soaking into rock under the ground, with a well reaching down to it

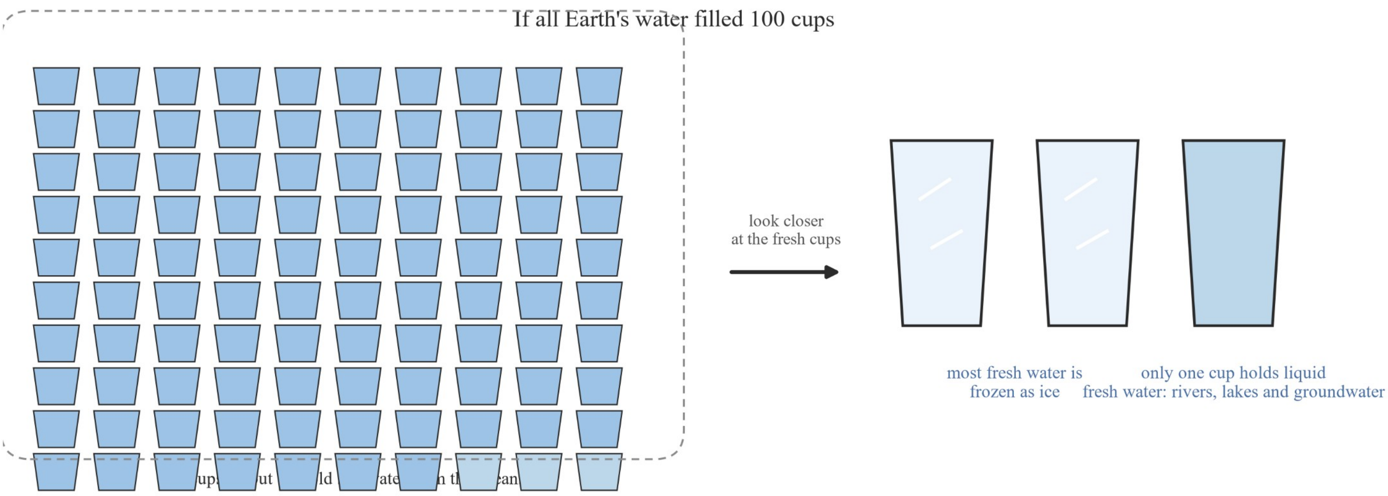
1. **In the oceans.** The oceans hold **salt water** — water with salt in it that tastes salty. You cannot drink salt water. Most of Earth's water is in the oceans.
2. **Frozen as ice.** A lot of Earth's water is frozen solid. It sits as **glaciers** — slow-moving rivers of ice high in the mountains — and as **ice caps**, which are thick sheets of ice over land near the coldest parts of Earth. Big chunks of ice that break off and float in the sea are called **icebergs**.

3. **On the land.** Fresh water sits on the land in **rivers**, **lakes**, **lagoons** and **wetlands**. A **wetland** is an area of land that is wet all year round, like a swamp or a marsh. In Victoria, the Murray River, the Goulburn River and the Yarra River are all sources of fresh water on the land.
4. **Under the ground.** Rainwater soaks down into the ground and fills the tiny spaces in the rock below. This is **groundwater**. Rock that holds a lot of groundwater is called an **aquifer**. People can dig a well down into an aquifer to bring the water up.

Fresh water is water that is not salty. It is the kind we can drink. The water on the land and under the ground in the picture above is fresh water.

If all Earth's water filled 100 cups

Here is a surprising fact: even though Earth has oceans full of water, very little of it is fresh water that we can use. Picture all Earth's water poured into 100 cups.



About 2 or 3 cups in every 100 hold fresh water — and most of that fresh water is frozen.

One hundred small cups in a grid: about 97 are filled blue for salt water and about 3 for fresh water; a closer look shows the fresh cups, two of them frozen as ice and only one holding liquid fresh water

About 97 cups in every 100 would hold salt water from the oceans. Only about 2 or 3 cups would hold fresh water. And most of the water in those few fresh cups is frozen as ice. The liquid fresh water we can use — the water in rivers, lakes and groundwater — is about one cup out of the whole hundred.

That is why fresh water is so precious, and why we need to look after it. (You may see this written with the percent sign, as "about 97%" and "about 3%". You only ever need to **read** those numbers here — you never have to work anything out with them.)

Sources of fresh water change over time

The places where fresh water is found are not always the same. They change with the weather.

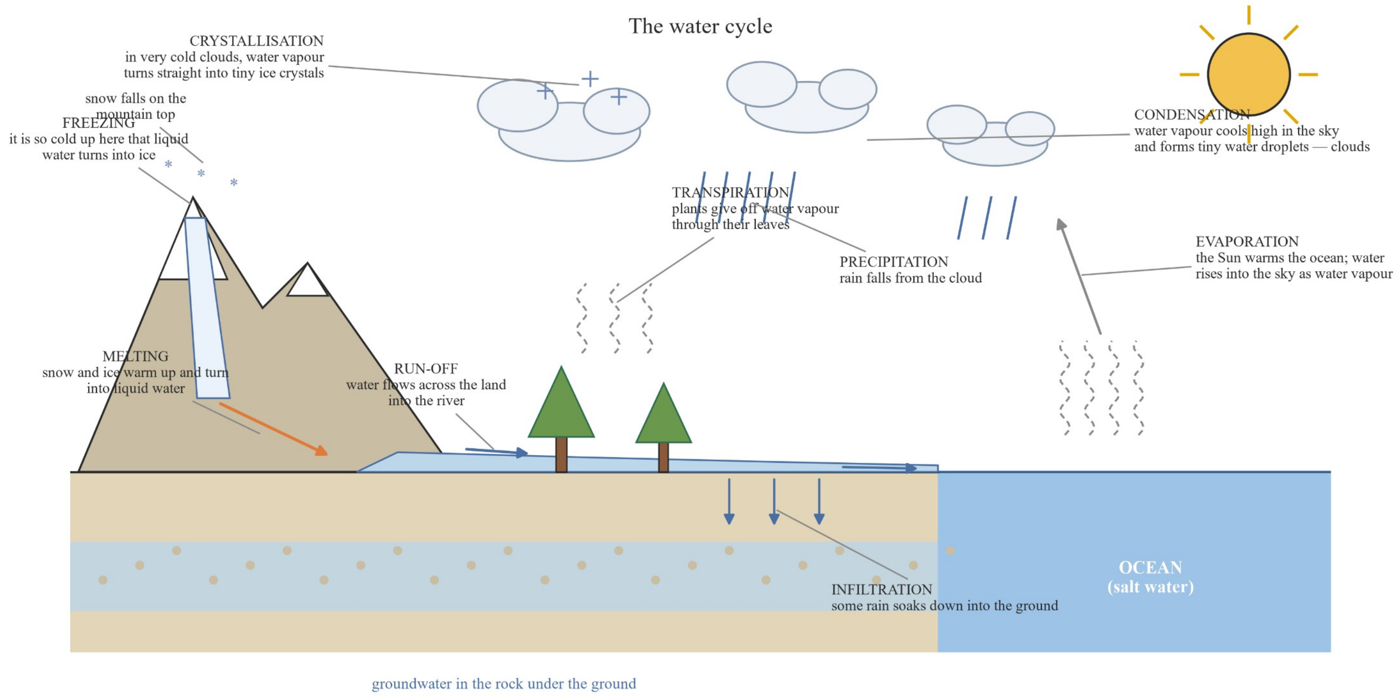
After heavy rain, a local creek can rise and flow much faster than usual, and a dry field can fill with puddles. In a hot, dry week, the sun warms the puddles. Bit by bit the water leaves them, and then they are gone — the water has **evaporated** into the air. Very soon you will see how evaporation works.

Sometimes a place goes through a **drought** — a long, dry time with much less rain than usual. In a drought, creeks and rivers can run low, and some dry right out. Farms and towns have to save water. In the next part of this subtopic you will see some real numbers that show how full Melbourne's water storages were during a drought, and how full they were after good wet years.

The water cycle: water on the move

The water you drink today may have been in the ocean last month, or in a cloud last week, or in a river last year. Water is always moving through the sky, the landscape and the ocean, in a loop that never ends, called the **water cycle**.

Here is the whole cycle in one picture. It names nine processes — nine things that happen to water as it cycles. You will meet each one in this subtopic.



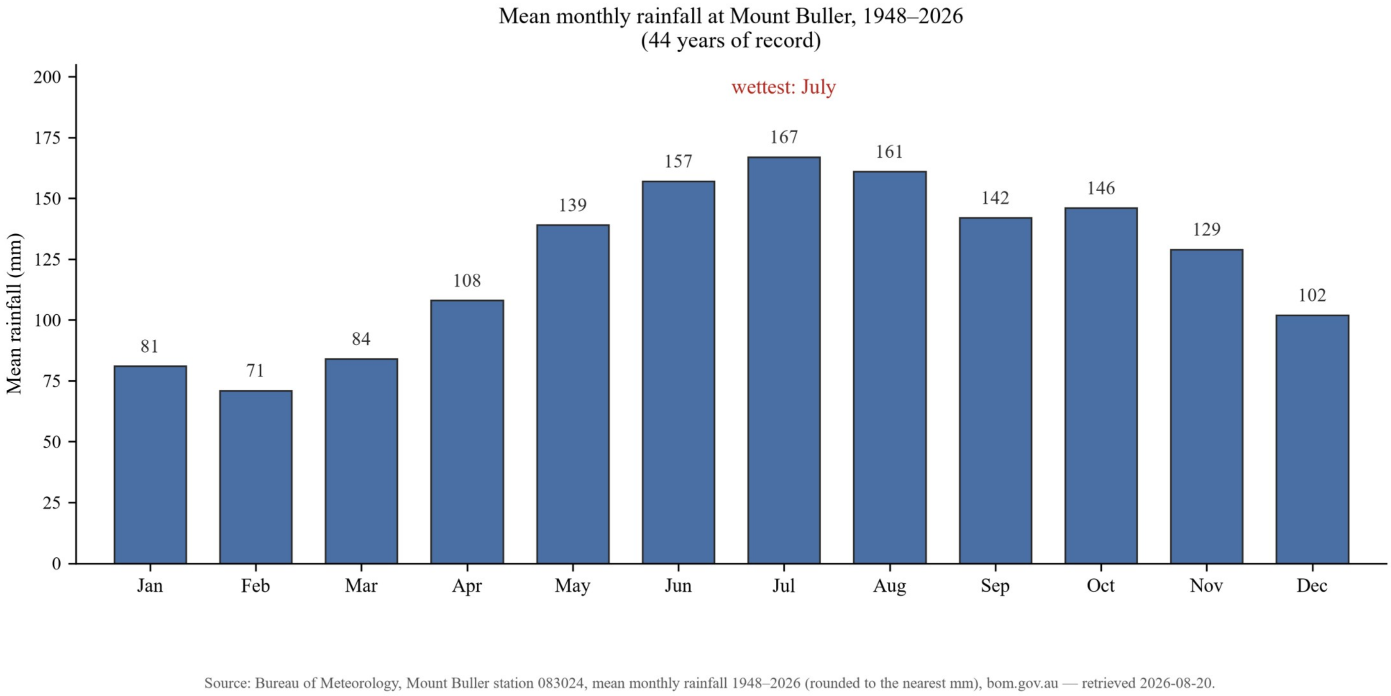
Water moves through the sky, the landscape and the ocean — cycling around and around, changing state as it goes.

A labelled landscape of the water cycle: the Sun warms the ocean and water rises as evaporation; plants give off water vapour by transpiration; vapour cools into clouds by condensation and into ice crystals by crystallisation; rain and snow fall as precipitation; snow and ice turn to water by melting; water soaks into the ground by infiltration and flows across the land as run-off into the river and back to the ocean

Precipitation — water falling from the sky

When clouds get heavy with water, the water falls back down. Water falling from the sky is called **precipitation**. Rain is precipitation. So is snow, and so is hail.

Precipitation does not fall the same amount every month, and different parts of Victoria get different amounts of it. Look at these real numbers from Mount Buller, a mountain in the Victorian Alps.



A column graph of mean monthly rainfall at Mount Buller from 1948 to 2026, rising from 81 mm in January to a wettest month of July at 167 mm

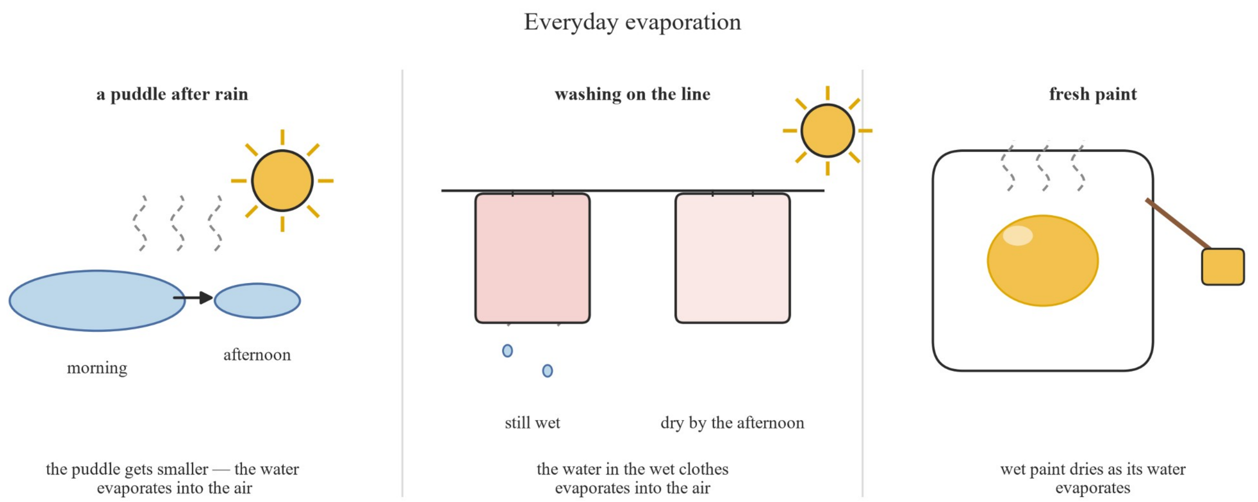
Source: Bureau of Meteorology, Mount Buller station 083024, mean monthly rainfall 1948–2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

The graph shows the mean rainfall for each month, worked out over 44 years. July is the wettest month, right in the middle of winter. In winter, Mount Buller is so cold that a lot of its precipitation falls as **snow**. The snow sits on the mountain, and when warm weather comes it melts and flows down into the rivers.

Evaporation — liquid water rising into the air

When the sun warms liquid water, some of it changes into a gas called **water vapour**. The water vapour rises up into the air, where you cannot see it. This change — liquid to gas — is called **evaporation**.

You saw in subtopic 4A that adding heat energy can change a liquid into a gas. Evaporation is that same change, happening outside, without any boiling. It happens slowly, every day, all around you.



Evaporation happens all around us, every day — liquid water turns into water vapour.

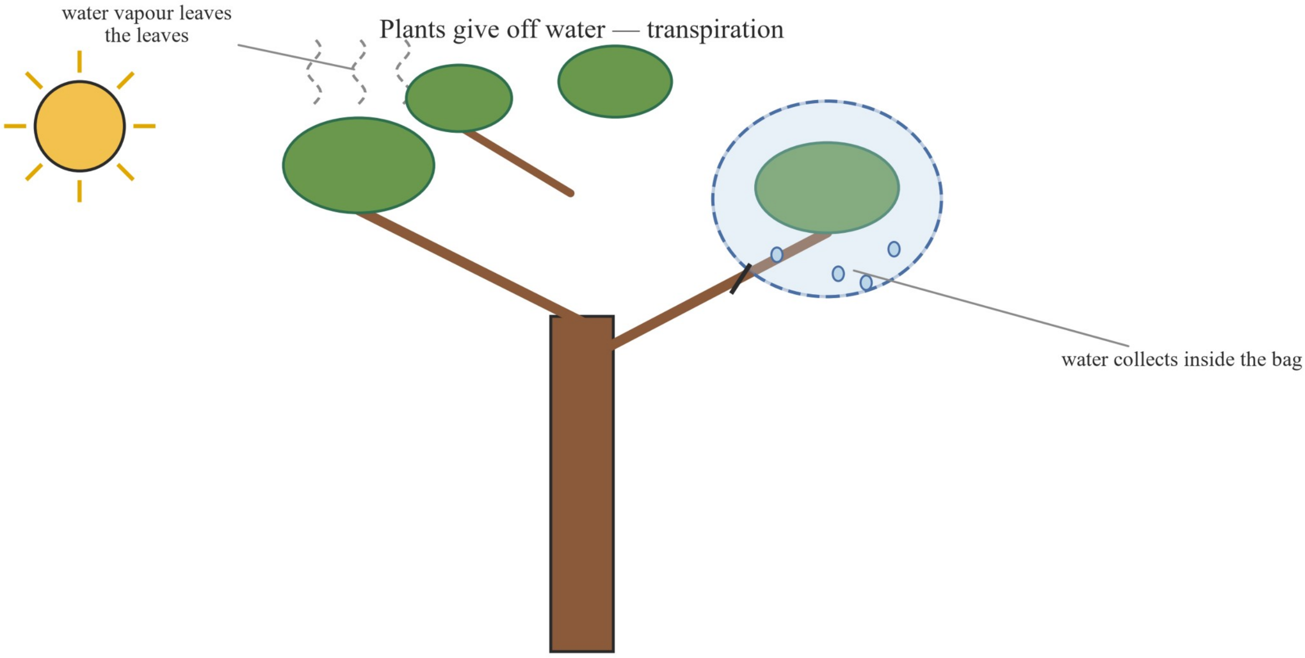
Three everyday examples of evaporation: a puddle shrinking from morning to afternoon, wet washing on the line drying in the sun, and wet paint drying on paper

A puddle after rain slowly goes away through the day, and by the afternoon it may be gone. Wet clothes on the line dry by lunchtime on a warm day. Fresh paint dries on your picture. In every case, the liquid water evaporates — it turns into water vapour and rises into the air.

Try this — watch water evaporate. Pour a little water into a shallow dish. Mark the water level on the side of the dish with a marker pen. First, **estimate**: where do you think the water level will be tomorrow? Now put the dish on a sunny windowsill and look at it each day. The level drops as the water evaporates. Safety: work with your teacher, and wipe up any spills straight away so nobody slips.

Transpiration — plants give off water too

Plants take in water through their roots. Some of that water travels up through the plant and leaves through the leaves, as water vapour. This is called **transpiration**.



Plants take in water through their roots. Some of it leaves through the leaves as water vapour.

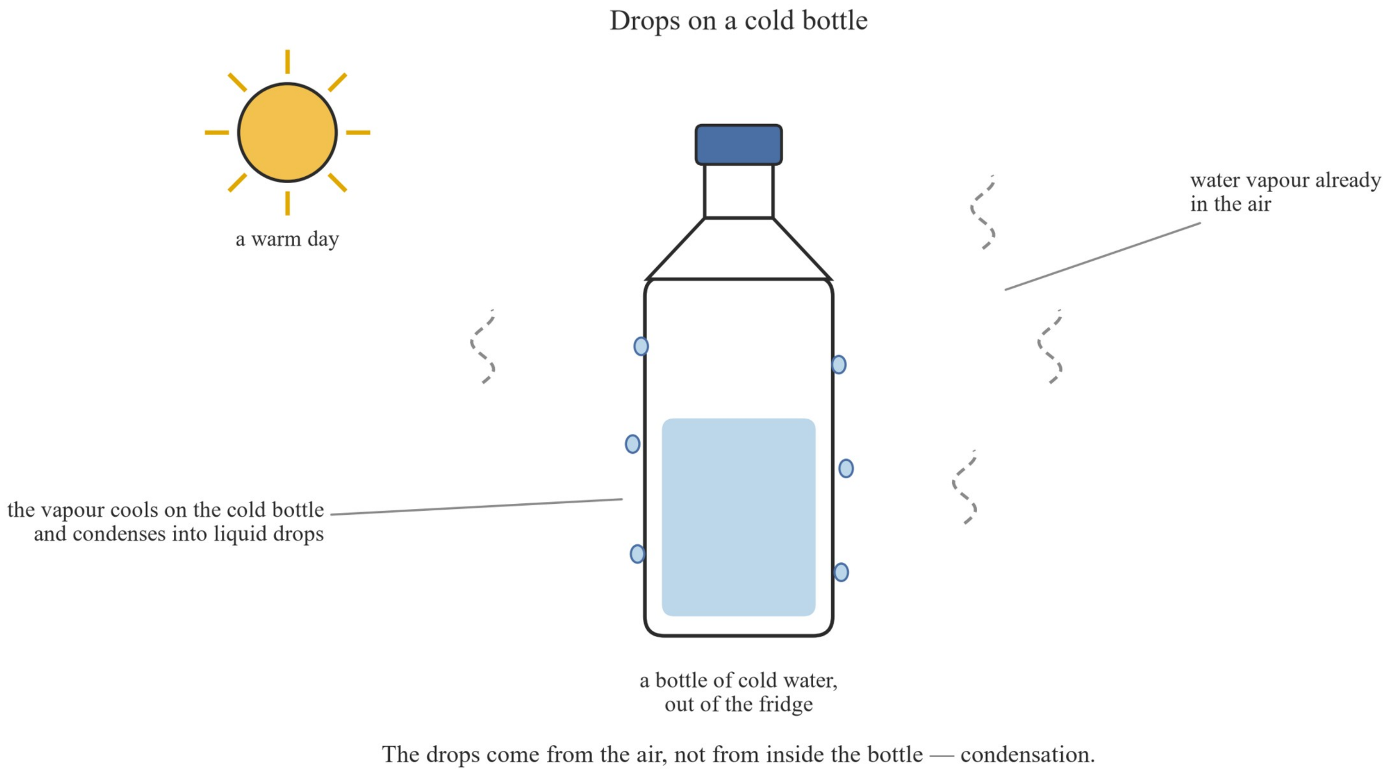
A leafy tree with a clear bag tied over one branch; drops of water collect inside the bag, showing the water the plant gives off, while water vapour rises from the other leaves

You can see transpiration for yourself. On a sunny day, tie a clear plastic bag over some leaves, leaving some air space inside. Come back a few hours later. Drops of water will have collected inside the bag. The water came from the leaves.

Safety: do this with your teacher, outdoors in the sun. Do not pull on the branch, and do not pull leaves off the plant.

Condensation — water vapour cooling back into liquid

Evaporation has an opposite. When water vapour cools down, it changes back into tiny drops of liquid water. This change — gas to liquid — is called **condensation**.



Drops of water forming on the outside of a cold bottle on a warm day, made from water vapour in the air cooling on the cold bottle

On a warm day, take a bottle of cold water out of the fridge. After a few minutes, drops of water form on the **outside** of the bottle. The bottle is not leaking. The drops come from water vapour that was already in the air. The cold bottle cooled the vapour, and the vapour condensed into liquid drops on the bottle.

Condensation is how clouds form. High up in the sky the air is much cooler than the air near the ground. When warm water vapour rises and cools up there, it condenses into tiny water droplets — and that is a cloud.

Melting and freezing — the changes you met in 4A

Two more of the water cycle's processes are changes of state you already know from subtopic 4A.

Melting is the change from solid to liquid. When the sun warms the snow on Mount Buller in spring, the snow melts into liquid water. That water runs down the mountain into the rivers.

Freezing is the change from liquid to solid. On a cold winter night, water in a puddle can freeze into ice. High on the mountains, it is cold enough for this to happen often.

Crystallisation — water vapour turning straight into ice

There is one more change of state, and it is new. In very cold clouds, and on very cold nights, water vapour does not become liquid first. It turns **straight from a gas into tiny ice crystals**. This change is called **crystallisation**.

Snow is made of ice crystals that formed high in very cold clouds. The frost that covers the grass on a freezing morning is made of ice crystals too — water vapour from the air crystallised straight onto the cold grass.

Infiltration — water soaking into the ground

When rain falls on the land, some of it soaks down into the soil and the rock below. This is called **infiltration**. The infiltrated water becomes groundwater, filling the tiny spaces in the rock of an aquifer. It may stay there a long time, or it may slowly seep into a creek or a river.

Run-off — water flowing across the land

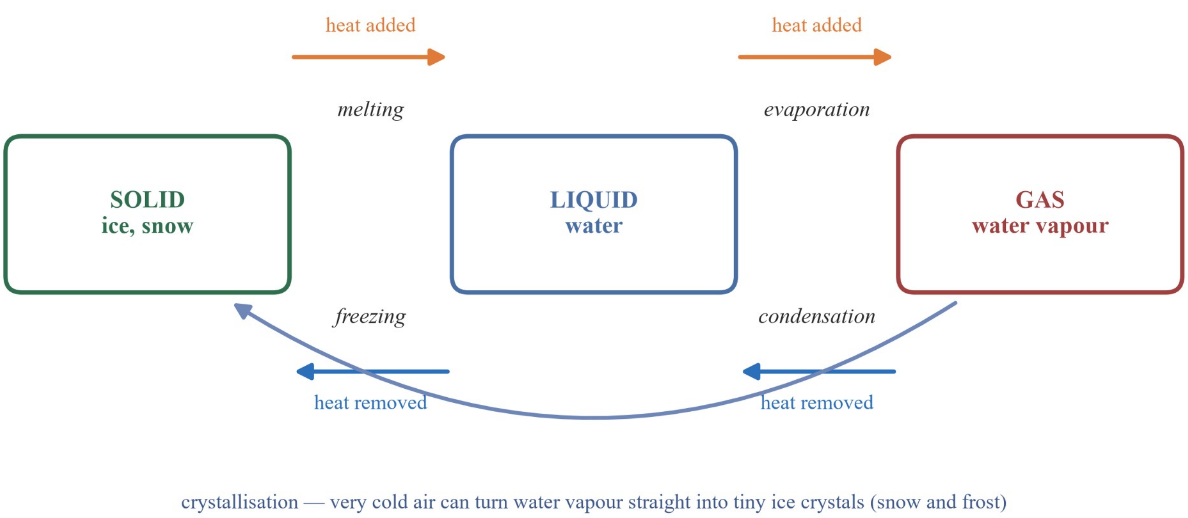
Not all rain soaks in. When the ground is already wet, or the rain falls fast, the water flows across the surface of the land. This moving water is called **run-off**. Run-off flows downhill, into creeks and rivers, and the rivers carry it to the ocean.

So the water that falls as precipitation has three main paths: it can evaporate back up, it can infiltrate into the ground, or it can run off across the land into the rivers. All three paths lead the water back around the cycle.

Water changes state as it cycles

Look back at the processes you have just met. Four of them — melting, freezing, evaporation and condensation — are changes of state from subtopic 4A. Crystallisation is the new one. Water is the same stuff all the way around the cycle; it just keeps changing state as heat energy is added and removed.

Water changes state — the map from 4A, with a new change



You met melting, freezing, evaporation and condensation in subtopic 4A. Crystallisation is new.

The map of changes of state from subtopic 4A — solid, liquid and gas with melting, freezing, evaporation and condensation — plus a new arrow showing crystallisation, where water vapour turns straight into ice crystals

Read the map both ways, just like in 4A:

- **Heat added:** ice melts into liquid water; liquid water evaporates into water vapour.
- **Heat removed:** water vapour condenses into liquid water; liquid water freezes into ice.
- **Very cold:** water vapour crystallises straight into ice crystals.

Follow one drop of water around the cycle

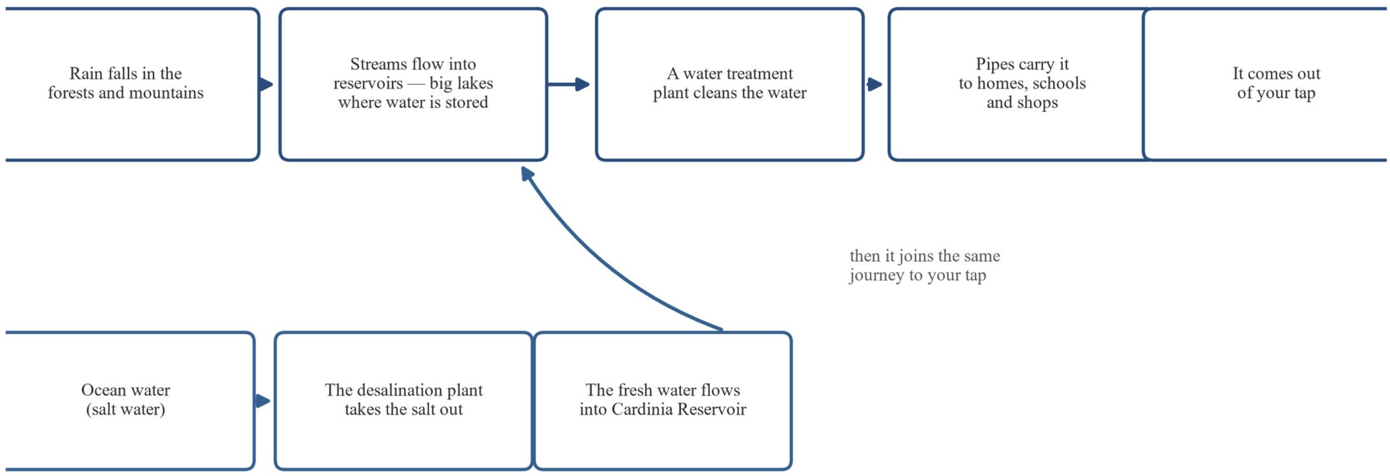
Start in the ocean. The sun warms the water, and your drop **evaporates** — it rises up as water vapour. High in the cool sky, it **condenses** into a tiny droplet, part of a cloud. More droplets join the cloud. When the cloud is heavy, the water falls as **precipitation** — let's say rain, over the Victorian Alps. Some of the rain **infiltrates** the ground; your drop runs across the land as **run-off**, into a creek, then into a river. The river carries it all the way back to the ocean — ready to go around again.

There is no start or finish to the water cycle. It just keeps going, powered by the sun's heat.

Where does Melbourne's tap water come from?

Turn on a tap in Melbourne, and water comes out — but where did it start?

Where does Melbourne's tap water come from?

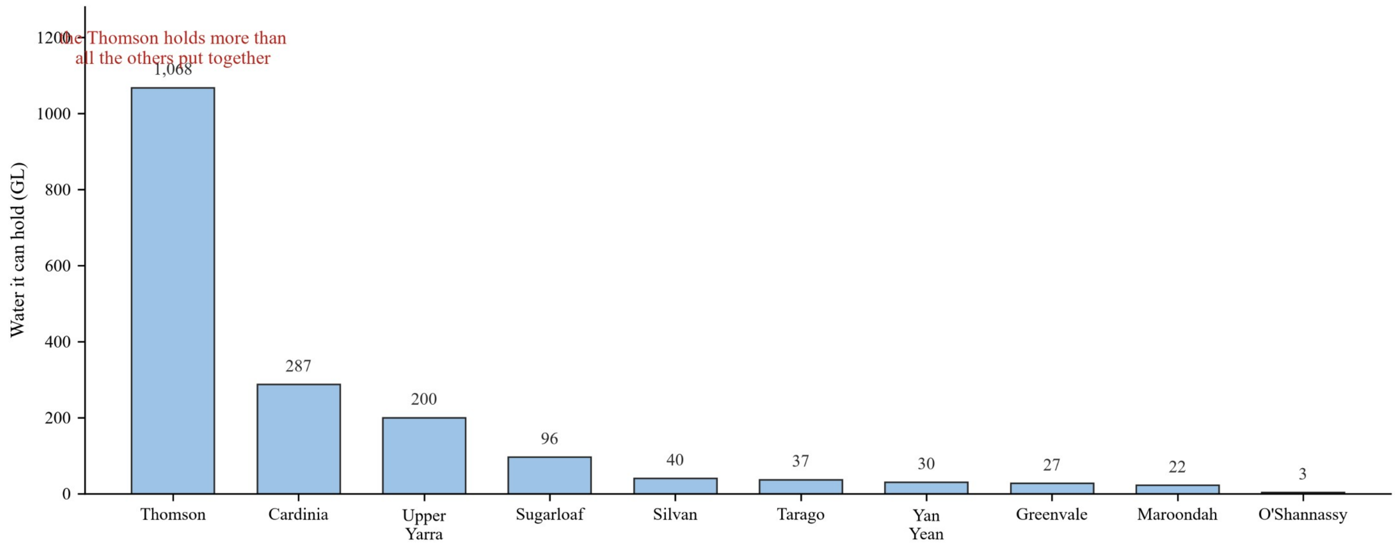


Most of Melbourne's tap water starts as rain. In dry times, the desalination plant at Wonthaggi can add water made from ocean water.

A flow diagram of Melbourne’s tap water: rain falls in forests and mountains, streams flow into reservoirs, a water treatment plant cleans the water, pipes carry it to homes and schools, and it comes out of the tap; a second row shows the desalination plant taking salt out of ocean water and adding the fresh water into Cardinia Reservoir

Most of Melbourne’s tap water starts as **rain** falling in the forests and mountains east of the city. Streams carry the rainwater into **reservoirs** — big lakes where water is stored. Melbourne has ten big reservoirs. From the reservoirs, the water goes to a water treatment plant, where it is cleaned. Then pipes carry it to homes, schools and shops — and out of your tap.

How much water can Melbourne's big reservoirs hold?



Source: Melbourne Water (melbournewater.com.au and Melbourne Water open data) — retrieved 2026-08-20.

GL = gigalitre: a unit for very large amounts of water.

A column graph of how much water Melbourne’s ten big reservoirs can hold, from the Thomson at 1,068 GL down to O’Shannassy at 3 GL

Source: Melbourne Water, Water storage reservoirs (melbournewater.com.au) — retrieved 2026-08-20.

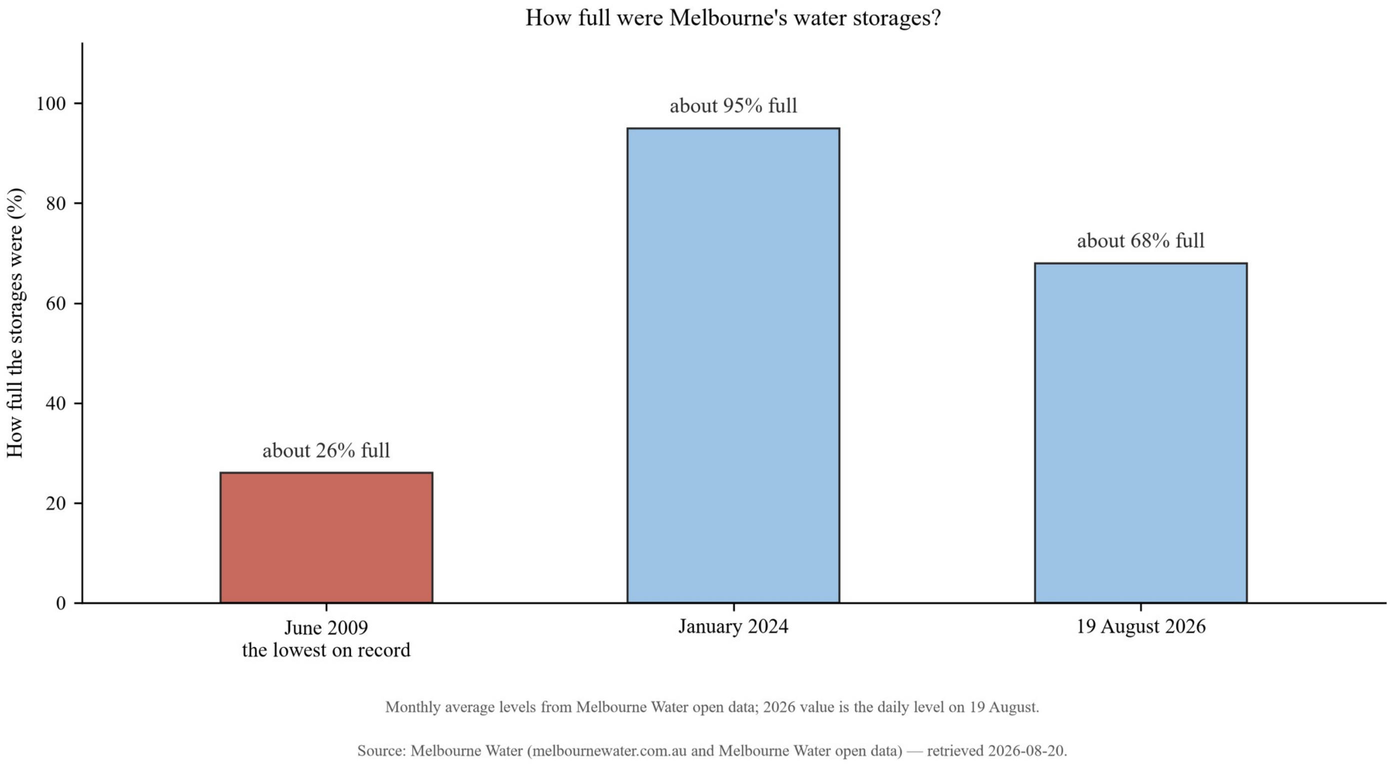
A **gigalitre** (GL) is a unit for very large amounts of water — the unit used in these graphs. The Thomson Reservoir can hold more water than all the other nine reservoirs put together.

In dry times, rain is not enough. Melbourne also has a **desalination plant** at Wonthaggi, near the coast. A desalination plant takes the salt out of ocean water and makes it into fresh water. The fresh water flows into Cardinia Reservoir and joins the same journey to your tap. The plant can make up to 150 GL of water in a year — about one third of what Melbourne needs.

Source: Melbourne Water, Victorian Desalination Plant (melbournewater.com.au) — retrieved 2026-08-20.

How full are the storages?

The amount of water in the reservoirs changes from year to year. Wet years fill them up; dry years bring them down. These real numbers show how full Melbourne's water storages were at three different times.



A column graph of how full Melbourne's water storages were at three times: about 26% full in June 2009, the lowest on record; about 95% full in January 2024; and about 68% full on 19 August 2026

Source: Melbourne Water open data, monthly average storage levels 1948–2026 and daily level for 19 August 2026 (melbournewater.com.au) — retrieved 2026-08-20.

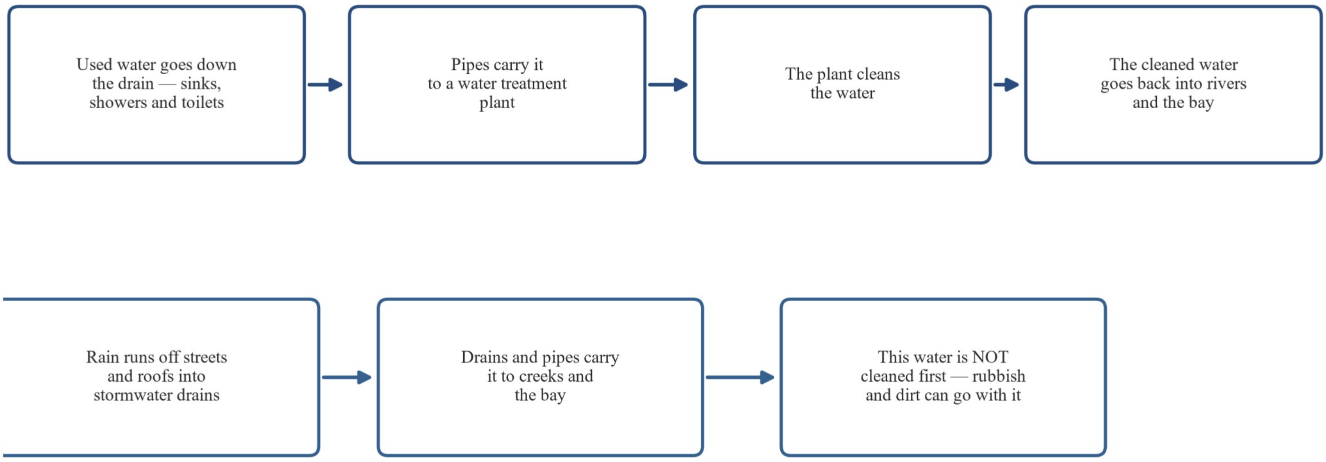
In June 2009, at the end of a long drought, the storages were the lowest they have ever been in these records — only about 26% full. That is about one quarter full. By January 2024, after wet years, they were about 95% full — almost full to the top. (Remember: you only need to read these numbers, never work anything out with them.)

Numbers like these show why people need to save water in a drought — and why saving water matters all the time.

Where does the water go when it disappears down the drain?

Water goes down the drain at your house every day — from the sink, the shower and the toilet. Where does it go? And what about the rain that runs off the street into a drain? These are two different journeys.

Where does the water go when it disappears down the drain?



Two different drains, two different journeys. Only the water we have used gets cleaned before it goes back.

A flow diagram with two rows: used water goes down the drain to a water treatment plant where it is cleaned before going back into rivers and the bay; rainwater runs off streets and roofs into stormwater drains and flows to creeks and the bay without being cleaned first

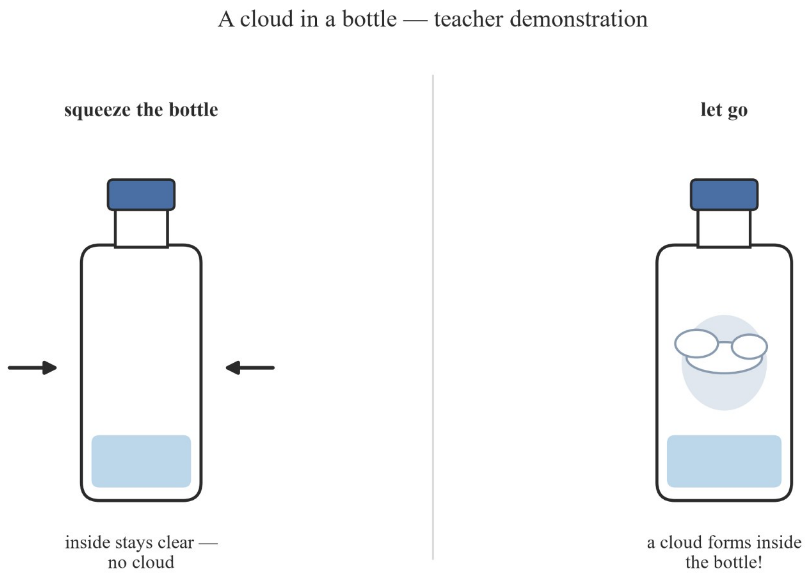
The water we have **used** travels by pipes to a water treatment plant, where it is cleaned before it goes back into the rivers and the bay.

Rainwater takes a different path. It runs off roofs and streets into **stormwater** drains, and the drains carry it straight to creeks and the bay. This water is **not** cleaned first — so any rubbish or dirt on the street can go with it. That is one good reason never to drop litter: whatever lands on the street can wash straight into the bay with the next rain.

Clouds, and how to make one

You met clouds earlier: a cloud is a lot of tiny water droplets, and sometimes tiny ice crystals, hanging in the air. The droplets are so small and light that they stay up in the air instead of falling.

What does water vapour need, to turn into a cloud? Two things. It needs to **cool** — condensation happens when vapour cools. And it needs something tiny to form on, like a speck of dust or smoke. Your teacher can make a cloud in a bottle to show it.



The teacher puts a little warm water and match smoke in the bottle and seals it. Letting go lets a cloud form; squeezing makes it go away. Matches and hot water are for the teacher only.

The cloud-in-a-bottle experiment in two panels: a sealed bottle with warm water and match smoke inside stays clear while squeezed, and a little cloud forms inside the bottle when the squeezing stops

The teacher puts a little warm water and some match smoke into a bottle and seals it. Squeezing the bottle keeps the inside clear — no cloud. Letting go lets a cloud form inside the bottle! Letting go lets the air inside cool a little, so the water vapour condenses onto the smoke specks, and you see a small cloud.

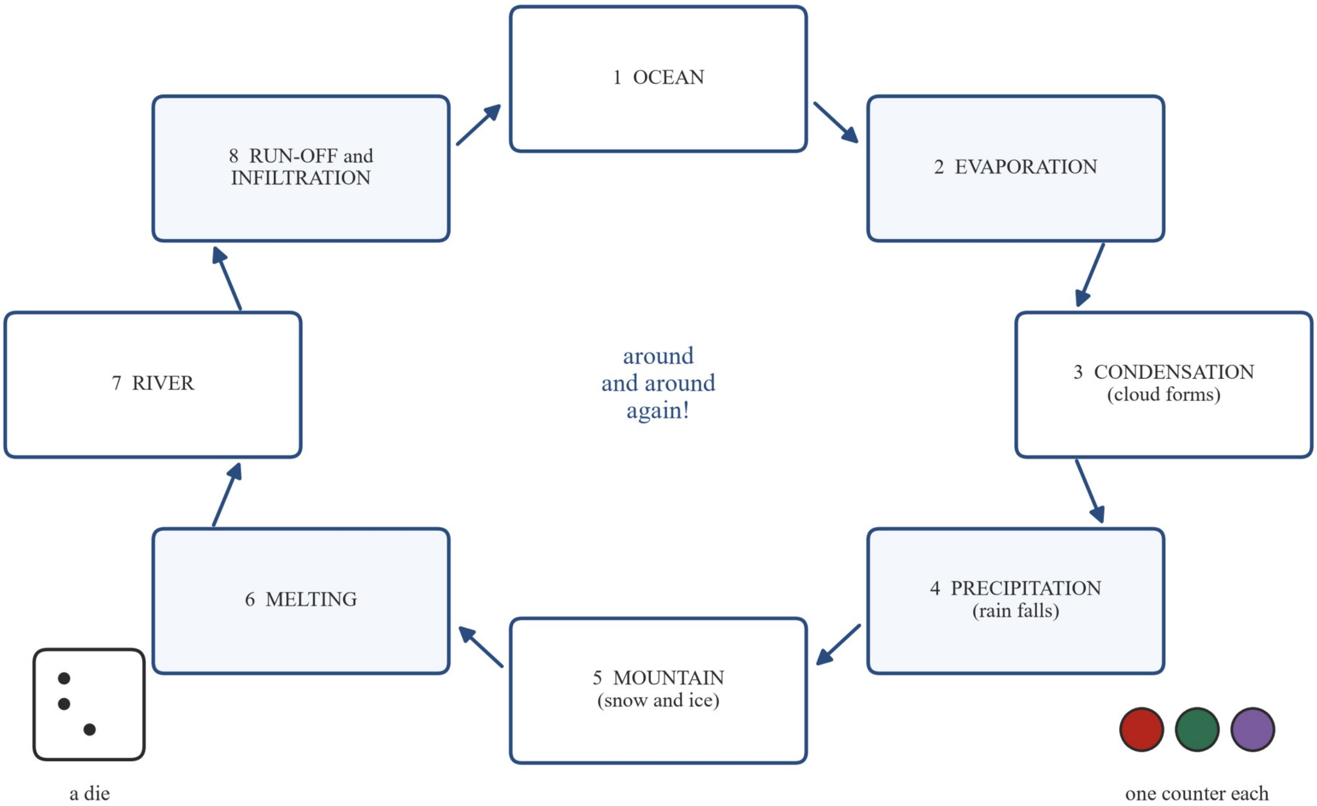
Safety: this experiment uses matches and warm water, so it is for the teacher only. You watch from a safe spot — observing is a full science job.

When enough droplets join together in a real cloud, they grow heavier and heavier. When they are too heavy to stay up, they fall — as rain, or as snow if the air is cold enough. That is precipitation, and the cycle starts again.

Play the water cycle

One good way to learn the cycle is to play it. You can build this game yourself.

The water-cycle game — make your own



Take turns rolling the die. Move your counter and say what happens to the water at that square.

A water-cycle board game drawn as a loop of eight squares — ocean, evaporation, condensation, precipitation, mountain with snow and ice, melting, river, and run-off and infiltration — with arrows going around the loop, plus a die and counters

Draw the eight squares in a loop, or make them as cards. Take turns rolling a die and moving your counter. Each time you land on a square, say what happens to the water there — for example, "evaporation: the sun warms the water and it rises into the air as water vapour." First player back to the ocean wins — and then keeps going, because the cycle never stops.

Compare the game with the big cycle picture earlier. The game shows eight of the nine processes. Which one is missing? (Look for the one that needs plants.) Talking about what a model shows — and what it leaves out — is part of doing science.

Worked examples

Worked example 1 — Match each observation to its water-cycle process. Choose from: *precipitation, evaporation, condensation, transpiration*.

(a) A puddle slowly goes away on a warm day.
(b) Drops of water form on the outside of a cold bottle.
(c) Rain falls from a grey sky.
(d) Water collects inside a bag tied over leafy branches.

Working	Comment
(a) The puddle is liquid water turning into water vapour and rising into the air.	Liquid to gas, without boiling, is **evaporation**.
(b) Water vapour in the air cooled on the cold bottle and	Gas to liquid is **condensation**.

Working	Comment
turned back into liquid drops.	
(c) Water is falling from the sky.	Water falling from the sky is **precipitation**.
(d) The water came from the leaves of the plant.	Plants giving off water vapour is **transpiration**.

Worked example 2 — Use the 100-cups picture to answer. (a) About how many cups out of 100 hold salt water? (b) About how many hold fresh water? (c) Most of the fresh water is in what state?

This is a reading job — there is nothing to work out.

(a) The picture shows about **97 cups** of salt water in every 100. (b) About **2 or 3 cups** hold fresh water. (c) Two of the fresh cups are white for ice: most fresh water is **frozen as ice** — the solid state.

∴ About 97 cups salt water, about 2 or 3 cups fresh water, and most of the fresh water frozen as ice.

Worked example 3 — Use the Mount Buller rainfall graph. (a) Which month is the wettest? (b) About how much rain falls in that month? (c) What season is that month in Victoria? (d) How much more rain falls in the wettest month than in January?

(a) The tallest column is **July**, so July is the wettest month. (b) The July column reaches 167 on the scale, so about **167 mm** of rain falls. (c) July is in the middle of **winter** in Victoria. (d) January's column reaches 81. Subtract: $167 - 81 =$ **86**.

∴ July is the wettest month with about 167 mm of rain — 86 mm more than January — and July is winter in Victoria.

Worked example 4 — Noah wrote the water cycle in this order: precipitation → evaporation → condensation → run-off → ocean. Fix his order, starting at the ocean, and say what was wrong.

Working	Comment
Start at the ocean. What happens first? The sun warms the water and it rises as water vapour: evaporation.	Evaporation must come before any cloud forms.
Next the water vapour cools high in the sky and forms a cloud: condensation.	Condensation makes the cloud.
Then water falls from the cloud: precipitation.	Noah had precipitation first — but rain cannot fall before a cloud forms.
On the land, water flows across the ground into rivers: run-off.	Run-off comes after the rain lands.
The rivers carry the water back to the ocean — the start again.	The cycle is a loop.

∴ The right order from the ocean is: evaporation → condensation → precipitation → run-off → ocean. Noah's mistake was starting with precipitation — rain cannot fall until water has evaporated and condensed into a cloud.

Practice questions

Scaffolded

Q1. Name the four main places where Earth's water is found. (Hint: look at the first picture in this subtopic.)

Q2. Fill in the gaps. (a) Water with salt in it, like the water in the oceans, is called ______ water. (b) Water that is not salty, that we can drink, is called ______ water.

Q3. Use the 100-cups picture. (a) About how many cups in every 100 hold salt water? (b) About how many hold fresh water? (c) Where is most of the fresh water kept — in what state?

Q4. Match each process to what it means: *evaporation, condensation, precipitation, transpiration*. (i) water falling from the sky as rain or snow; (ii) liquid water warming and rising into the air as water vapour; (iii) water vapour cooling and turning back into tiny liquid drops; (iv) plants giving off water vapour through their leaves.

Q5. Name the process happening in each observation. (a) A puddle disappears on a warm afternoon. (b) Drops form on the outside of a cold drink bottle. (c) Snow falls on Mount Buller. (d) Water collects in a bag tied over leafy branches.

Q6. Think back to subtopic 4A. (a) What is the change of state called when ice turns into liquid water? (b) What is the change called when liquid water turns into ice? (c) Which one happens when heat energy is added?

Q7. Where does most of Melbourne's tap water start from, before it is stored in the reservoirs?

Q8. True or false: a cloud is made of tiny water droplets hanging in the air.

Unscaffolded

Q9. The water cycle names nine processes. List all nine.

Q10. Follow one drop of water around the cycle, starting in the ocean. Write the stages in order, using these words: *ocean, evaporation, condensation, precipitation, run-off, river*.

Q11. Crystallisation is the new change of state in this subtopic. Explain it in your own words, and name two things it makes.

Q12. Zali takes a bottle of cold water out of the fridge on a warm day. Soon the outside of the bottle is wet. "The bottle is leaking," she says. Is she right? Explain where the water really comes from, and name the process.

Q13. Look at the Mount Buller rainfall graph. (a) Which month has the least rain? (b) In which season does Mount Buller get most of its precipitation as snow? (c) When the snow on the mountain warms up in spring, what change of state happens, and where does the water go?

Q14. Look at the reservoir graph. (a) Which reservoir can hold the most water? (b) About how much can it hold? (c) Which reservoir can hold the least?

Q15. Look at the graph of how full Melbourne's storages were. (a) In which month and year were the storages the lowest on record? (b) About how full were they then? (c) What was happening with the rain in those years — was it a wet time or a dry time?

Q16. There are two kinds of drains at your house. (a) Where does the water from the sink and the shower go before it goes back into the rivers? (b) Where does rainwater from the street go? (c) Which of these two waters is cleaned first?

Q17. In the cloud-in-a-bottle experiment: (a) what did the teacher put in the bottle? (b) what happened when the teacher squeezed the bottle, and when the teacher let go? (c) Name the two things water vapour needs in order to form a cloud.

Q18. The water-cycle game is drawn as a loop, not a straight line. Why? And which one of the nine processes does the game leave out?

Answers

Q1. In the oceans; frozen as ice; on the land (rivers, lakes, lagoons and wetlands); and under the ground (groundwater).

Q2. (a) salt; (b) fresh.

Q3. (a) About 97 cups; (b) about 2 or 3 cups; (c) frozen as ice — the solid state.

Q4. (i) precipitation; (ii) evaporation; (iii) condensation; (iv) transpiration.

Q5. (a) evaporation; (b) condensation; (c) precipitation; (d) transpiration.

Q6. (a) melting; (b) freezing; (c) melting.

Q7. Rain falling in the forests and mountains east of Melbourne.

Q8. True.

Q9. Precipitation, evaporation, transpiration, condensation, melting, freezing, crystallisation, infiltration and run-off.

Q10. Ocean → evaporation → condensation → precipitation → run-off → river → back to the ocean.

Q11. Water vapour turning straight into tiny ice crystals, without becoming liquid first. It makes snow and frost.

Q12. No. The water came from water vapour in the air, which cooled on the cold bottle and condensed into liquid drops: condensation.

Q13. (a) January; (b) winter; (c) melting — the snow turns into liquid water that flows down the mountain into the rivers.

Q14. (a) The Thomson Reservoir; (b) 1,068 GL; (c) O'Shannassy Reservoir.

Q15. (a) June 2009; (b) about 26% full; (c) a dry time — a drought, with less rain than usual.

Q16. (a) To a water treatment plant, where it is cleaned; (b) through stormwater drains to creeks and the bay, without being cleaned; (c) the used water from the sink and shower.

Q17. (a) A little warm water and some match smoke; (b) squeezing kept the inside clear — no cloud — and letting go let a cloud form; (c) it needs to cool, and it needs tiny specks (like dust or smoke) to form on.

Q18. Because the water cycle never stops — it goes around and around, with no start or finish. The game leaves out transpiration.

Fully-worked solutions

Q1. The first picture shows four panels. The first is the oceans, holding salt water. The second is water frozen as ice — glaciers and ice caps. The third is water on the land: rivers, lakes, lagoons and wetlands. The fourth is water under the ground: groundwater in the rock, with a well reaching down to it. So the four main places are the oceans, ice, the land, and under the ground.

Q2. Salt water is water with salt in it — the oceans hold it, and we cannot drink it. Fresh water is water that is not salty, like the water in rivers, lakes and groundwater. So: (a) salt; (b) fresh.

Q3. The 100-cups picture is a way to see the share of salt water and fresh water without working anything out. (a) Count the blue cups: about 97 in every 100 hold salt water. (b) That leaves about 2 or 3 cups holding fresh water. (c) Of those fresh cups, two are white for ice — so most fresh water is frozen as ice, the solid state.

Q4. Match each meaning to a process. (i) Water falling from the sky — as rain, snow or hail — is **precipitation**. (ii) Liquid water warming and rising as water vapour — liquid to gas — is **evaporation**. (iii) Water vapour cooling back into tiny liquid drops — gas to liquid — is **condensation**. (iv) Plants giving off water vapour through their leaves is **transpiration**.

Q5. Sort each observation by what the water is doing. (a) The puddle is liquid water turning into water vapour and rising into the air: **evaporation**. (b) The drops formed when water vapour in the air cooled on the cold bottle: **condensation**. (c) Snow is water falling from the sky: **precipitation**. (d) The water in the bag came from the plant's leaves: **transpiration**.

Q6. In 4A you learned that adding heat energy and removing heat energy cause changes of state. (a) Solid to liquid is **melting**: ice melts into liquid water when heat energy is added. (b) Liquid to solid is **freezing**: liquid water freezes into ice when heat energy is removed. (c) So it is **melting** that happens when heat energy is added.

Q7. Follow the tap water diagram back from the reservoir. The streams that fill the reservoirs carry rainwater — so most of Melbourne's tap water starts as **rain falling in the forests and mountains** east of the city. (In dry times, the desalination plant at Wonthaggi adds water made from ocean water too.)

Q8. True. A cloud is a large number of tiny water droplets — and sometimes tiny ice crystals — hanging in the air. They are so small and light that they stay up instead of falling.

Q9. The big cycle picture labels all nine. Read them off: **precipitation** (water falling from the sky), **evaporation** (liquid warming into water vapour), **transpiration** (plants giving off water vapour), **condensation** (vapour cooling into droplets), **melting** (ice and snow turning to liquid), **freezing** (liquid turning to ice), **crystallisation** (vapour turning straight into ice crystals), **infiltration** (rain soaking into the ground) and **run-off** (water flowing across the land).

Q10. Start in the ocean. The sun warms the water, and the drop rises as water vapour — **evaporation**. High in the cool sky, the vapour turns into tiny droplets and forms a cloud — **condensation**. The cloud grows heavy, and water falls over the land — **precipitation**. On the land, the water flows across the ground — **run-off** — into a creek, then a **river**, and the river carries it back to the **ocean**. So: ocean → evaporation → condensation → precipitation → run-off → river → ocean, and around again.

Q11. In 4A's map, gas to liquid was condensation, and liquid to solid was freezing. Crystallisation is a shortcut: when the air is very cold, water vapour turns **straight into tiny ice crystals**, without becoming liquid first. Two things it makes: **snow** (ice crystals that formed high in very cold clouds) and **frost** (ice crystals that formed on cold grass and windows).

Q12. Test Zali's idea. If the bottle were leaking, the water would come from inside the bottle — but the bottle is sealed, and the water level inside has not dropped. The real story: the air around the bottle holds water vapour. The cold bottle cooled that vapour, and the vapour changed state back into liquid water on the outside of the bottle — gas to liquid, heat energy removed. That change is **condensation**, the same one that makes clouds. Zali is not right.

Q13. (a) Find the shortest column on the graph: **January**, at about 71 mm. (b) The wettest months are June, July and August — **winter** in Victoria — when Mount Buller is cold enough for much of its precipitation to fall as snow. (c) When the snow warms up in spring, it **melts** — solid to liquid — and the water runs down the mountain into the rivers as run-off.

Q14. (a) Find the tallest column: the **Thomson** Reservoir. (b) Read its value: **1,068 GL**. (c) Find the shortest column: **O'Shannassy**, at 3 GL. (Notice how much more water the Thomson can hold than all the others put together.)

Q15. (a) The lowest column on the graph is labelled **June 2009** — the lowest on record. (b) It reaches about **26% full** — about one quarter full. (c) The storages were that low because it was a **dry time** — a drought, with much less rain than usual, so the streams that fill the reservoirs were bringing in little water. Wet years afterwards filled the storages back up, to about 95% by January 2024.

Q16. Follow the drain diagram. (a) Water from sinks, showers and toilets travels by pipes to a **water treatment plant**, where it is cleaned before it goes back into the rivers and the bay. (b) Rainwater from the street runs into **stormwater drains**, which carry it to creeks and the bay — it is **not** cleaned on the way. (c) So the **used water** is the water that is cleaned first; the rainwater from the street is not cleaned at all. That is why litter on the street can end up in the bay.

Q17. (a) The teacher put a little **warm water** and some **match smoke** into the bottle, then sealed it. (b) **Squeezing** the bottle kept the inside clear — no cloud — and **letting go** let the air inside cool a little, so a cloud formed. (c) The two things water vapour needs to form a cloud: it needs to **cool** (condensation happens when vapour cools), and it needs something **tiny to form on**, like a speck of dust or smoke — that is what the match smoke was for.

Q18. The game is a loop because the water cycle is a loop: the same water keeps moving around and around, with no start and no finish. A straight line would have an end, and the water cycle does not. The eight squares show eight of the nine processes; the one missing is **transpiration** — the process that needs plants.

Words to know in 5B

Word	What it means
resource	something people can use
water cycle	the loop that water moves through, again and again: sky, landscape and ocean
salt water	water with salt in it, like the water in the oceans
fresh water	water that is not salty, that we can drink
water vapour	water as a gas, rising in the air
precipitation	water falling from the sky: rain, snow or hail
evaporation	liquid water warming and changing into water vapour
transpiration	plants giving off water vapour through their leaves
condensation	water vapour cooling and changing back into tiny liquid drops
melting	the change from solid to liquid (heat added)
freezing	the change from liquid to solid (heat removed)
crystallisation	water vapour turning straight into tiny ice crystals
infiltration	rain soaking down into the soil and rock
run-off	water flowing across the surface of the land
groundwater	water that has soaked into the rock under the ground
aquifer	rock that holds a lot of groundwater
glacier	a slow-moving river of ice high in the mountains
ice cap	a thick sheet of ice over land near the coldest parts of Earth
iceberg	a big chunk of ice floating in the sea
wetland	an area of land that is wet all year round, like a swamp or a marsh
lagoon	a shallow area of water near the coast or a river
reservoir	a big lake where water is stored for people to use
gigalitre (GL)	a unit for very large amounts of water
drought	a long, dry time with much less rain than usual
desalination plant	a plant that takes the salt out of ocean water to make fresh water

Weather, climate, and human activity

What we teach here — `VC2S4U08` (Victorian Curriculum F–10 Version 2.0, Science, Levels 3 and 4): “weather events and climate have impacts on the land, air, water and living things; human activity can affect climate”. **In our words:** the weather changes from day to day, but a place’s climate is what its weather is usually like, worked out from many years of records. Weather events such as storms, floods, heatwaves and bushfires make changes to the land, the air, the water and living things. People’s activities can affect the climate too — and there are things people can do to lessen that effect. The teaching contexts come from the elaborations of `VC2S4U08` (`.E01–.E03`). `VC2S4U08.E04` is reserved under the ICIP decision and is not taught here.

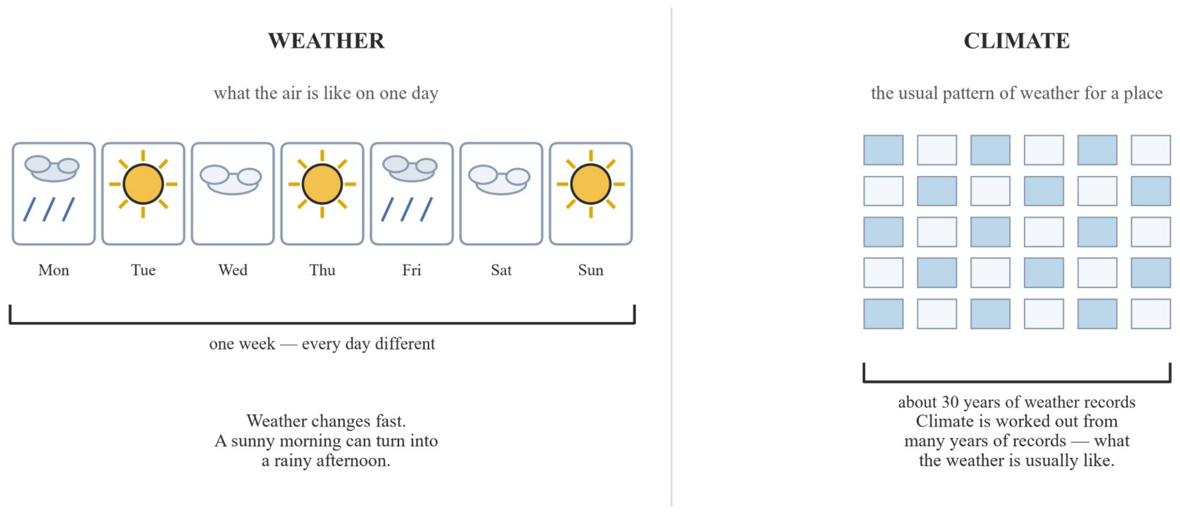
Theory

Weather is what the air is like on one day

Look outside. Is the sun shining? Are there clouds? Is the wind blowing? Is rain coming down? What the air is like right now, today, is the **weather**.

The weather can change fast. A sunny morning can turn into a rainy afternoon. One day can be hot, and the next day can be cool.

Weather and climate are not the same thing



Weather is what is happening today. Climate is what the weather is usually like at a place, over many years.

Two panels side by side. Left panel, WEATHER: seven day-cards for one week, some sunny, some cloudy, some rainy, with one week written below — every day different, and text saying weather changes fast. Right panel, CLIMATE: a grid of small squares standing for about 30 years of weather records, with about 30 years of weather records written below, and text saying climate is worked out from many years of records

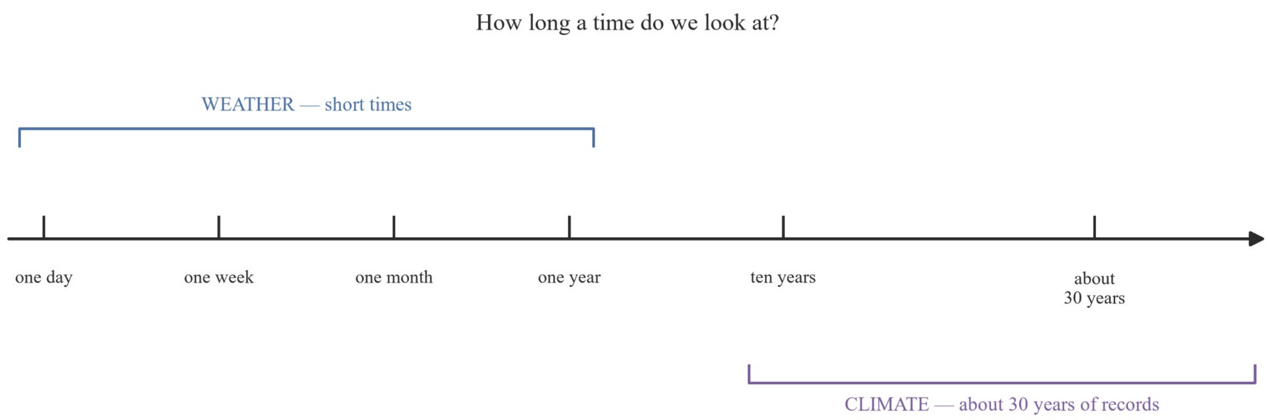
Climate is what the weather is usually like

Today’s weather in Melbourne might be rain. Tomorrow’s might be sun. But people who live in Melbourne know that winter is usually the wettest time of the year, and summer is usually the hottest. That usual pattern of weather, for one place, is its **climate**.

We work out a place’s climate from its weather records — not one week of records, but **about 30 years** of them. Climate is what the weather is *usually* like at a place.

The time we look at is the difference

Weather and climate are not the same thing, and the difference is **time**. Weather looks at short times — hours, days and weeks. Climate looks at a long time — about 30 years of records.

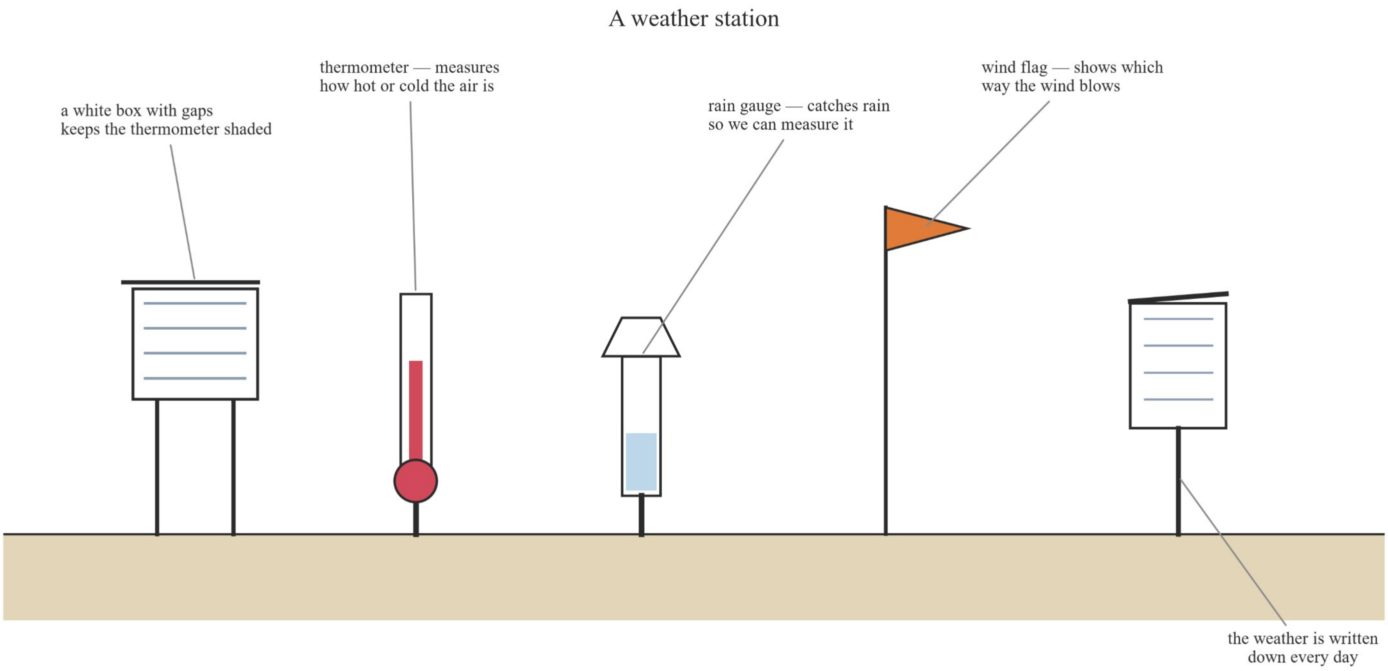


Weather looks at days and weeks. Climate looks at what the weather was like over about 30 years.

A time ruler with marks for one day, one week, one month, one year, ten years and about 30 years. WEATHER — short times is written above the short end, and CLIMATE — about 30 years of records is written below the long end

How do we know what the weather does?

People measure the weather at a **weather station**. A weather station has simple tools that are checked every day.



All these tools together are a weather station. There are weather stations all over Victoria.

A labelled weather station: a white box with gaps that keeps the thermometer shaded, a thermometer, a funnel and jar that catch rain, a flag that shows which way the wind blows, and a clipboard where the weather is written down every day

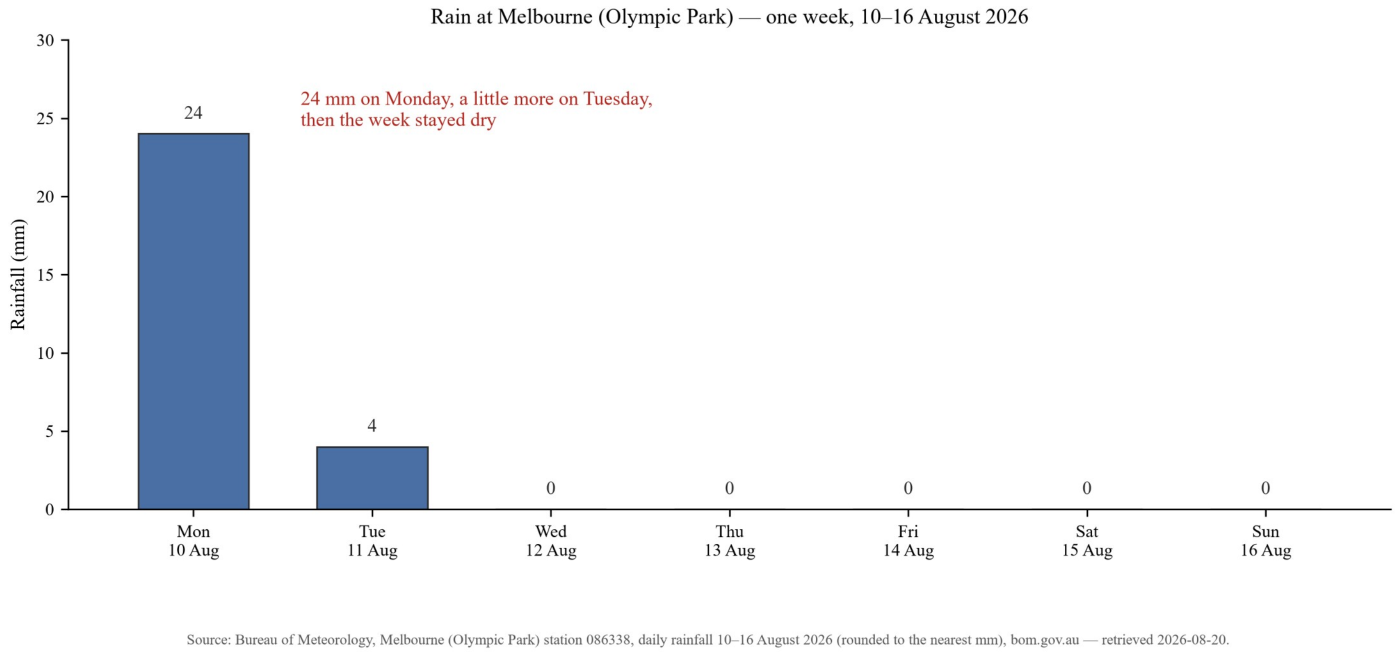
- A **thermometer** measures how hot or cold the air is. You learned to read one in 1C.
- A **rain gauge** catches the rain and holds it, so we can measure how much came down.
- A flag shows which way the wind blows.
- Everything is written down, every day. That is how the records grow.

In Australia, the Bureau of Meteorology looks after weather stations all over the country and keeps the records. There are weather stations all over Victoria.

Try this — keep a weather diary for one week. First, **estimate**: how many of the next seven days do you think will have rain? Now keep a diary. Each day at recess, go outside with your teacher and record what the sky is like: sun, cloud or rain. If your school has a thermometer in the shade, read it the way you learned in 1C. After seven days, look back at your diary. Was every day the same? Did your week match your estimate? Safety: walk, do not run, when you are outside. Stay with your teacher. Wash your hands afterwards.

Real numbers — one week of weather

Here are real records from the weather station at Melbourne (Olympic Park). They show the rain for one week in August 2026, day by day.



A column graph of daily rainfall at Melbourne (Olympic Park) for the week Monday 10 to Sunday 16 August 2026: 24 mm on Monday, 4 mm on Tuesday, and 0 mm on every other day

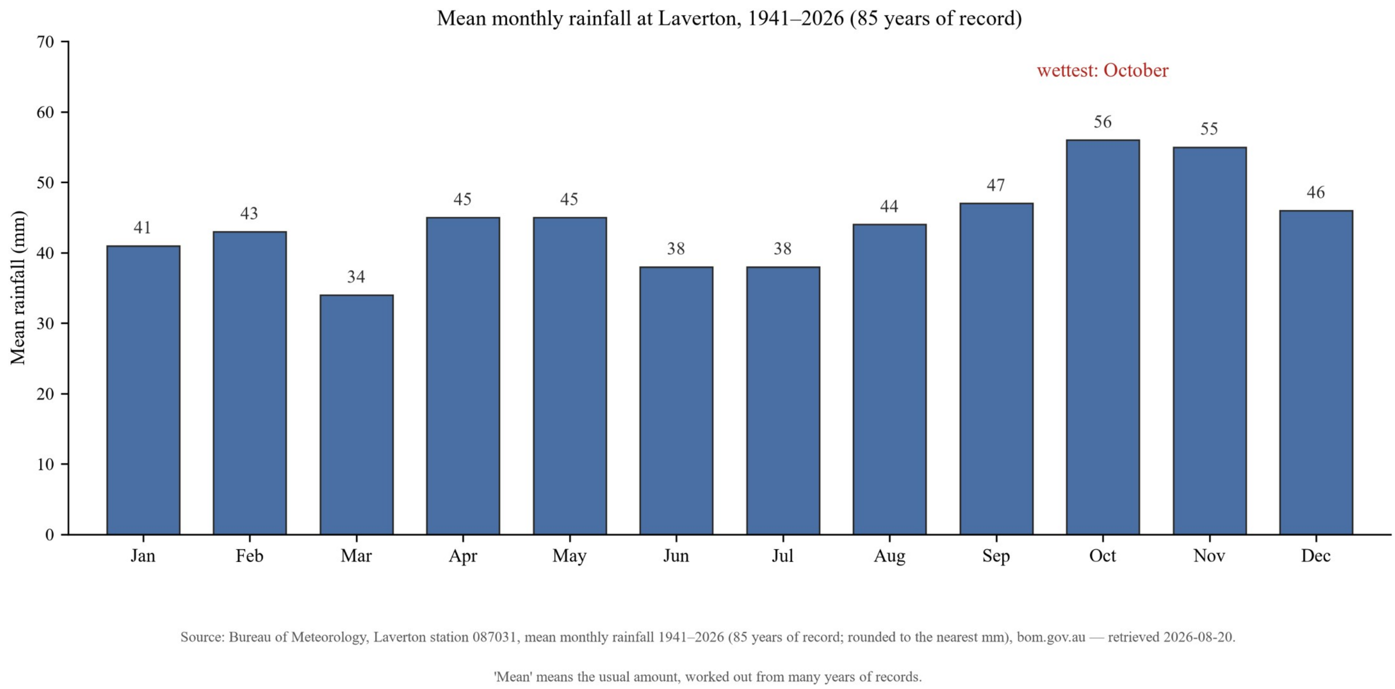
Source: Bureau of Meteorology, Melbourne (Olympic Park) station 086338, daily rainfall 10–16 August 2026 (rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

Read the graph. On Monday, 24 mm of rain came down — a wet day! A little more rain came on Tuesday. Then the week stayed dry. Five days in a row had no rain at all.

That is weather. It can change from one day to the next.

Real numbers — what the rain is usually like

One week of rain tells us about the weather. To see the **climate**, we need many years of records. Here is what the rain is usually like at Laverton, near Melbourne, worked out from 85 years of records.



A column graph of mean monthly rainfall at Laverton from 1941 to 2026, with the tallest column in October at 56 mm and the shortest in March at 34 mm, and a note that mean means the usual amount worked out from many years of records

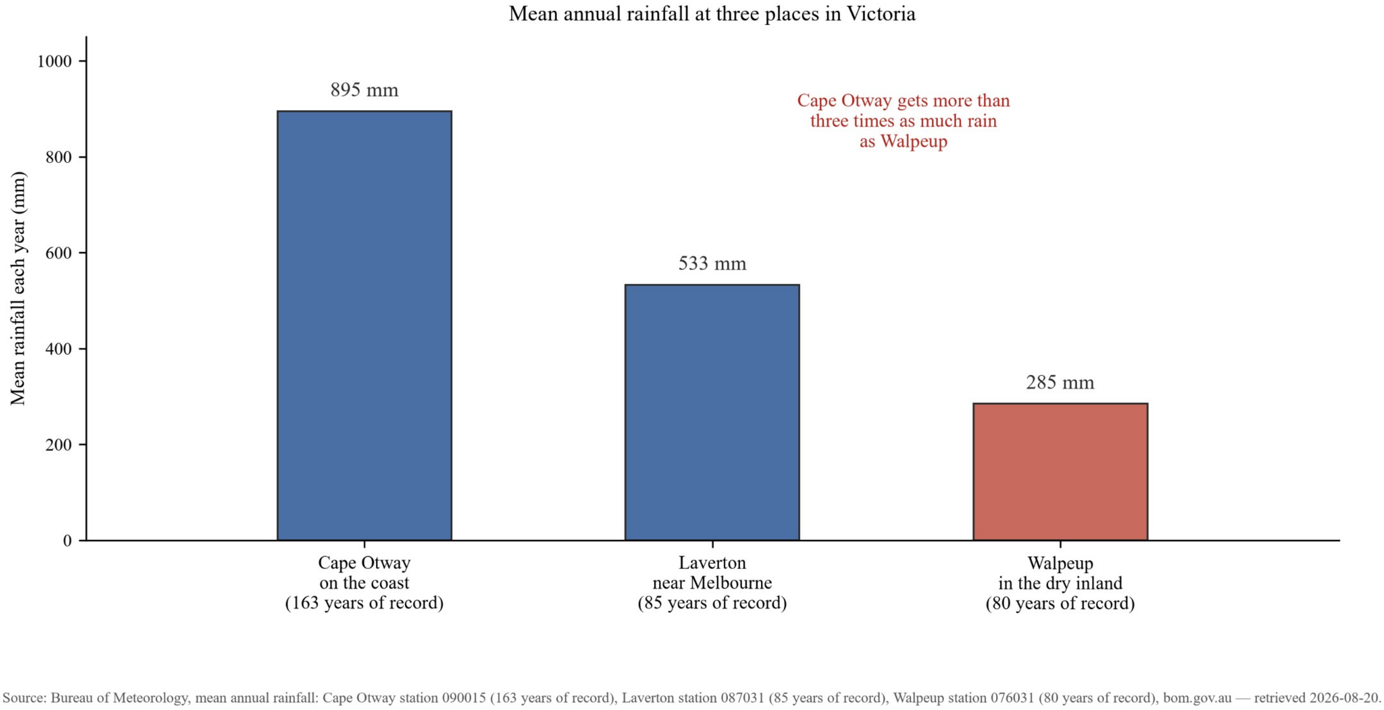
Source: Bureau of Meteorology, Laverton station 087031, mean monthly rainfall 1941–2026 (85 years of record; rounded to the nearest mm), bom.gov.au — retrieved 2026-08-20.

The word **mean** here means the usual amount, worked out from all those years of records. The graph does not show one wet week in one year. It shows what each month is usually like.

Look at the shape of the columns. The wettest month is October, in spring. The driest month is March, at the end of summer. That shape — wet springs, drier late summers — is part of the climate near Melbourne.

Different places, different climates

Victoria is one state, but it does not have just one climate. Look at the mean rainfall each year at three places in Victoria.



A column graph of mean annual rainfall at three places in Victoria: Cape Otway on the coast at 895 mm, Laverton near Melbourne at 533 mm, and Walpeup in the dry inland at 285 mm, with a note that Cape Otway gets more than three times as much rain as Walpeup

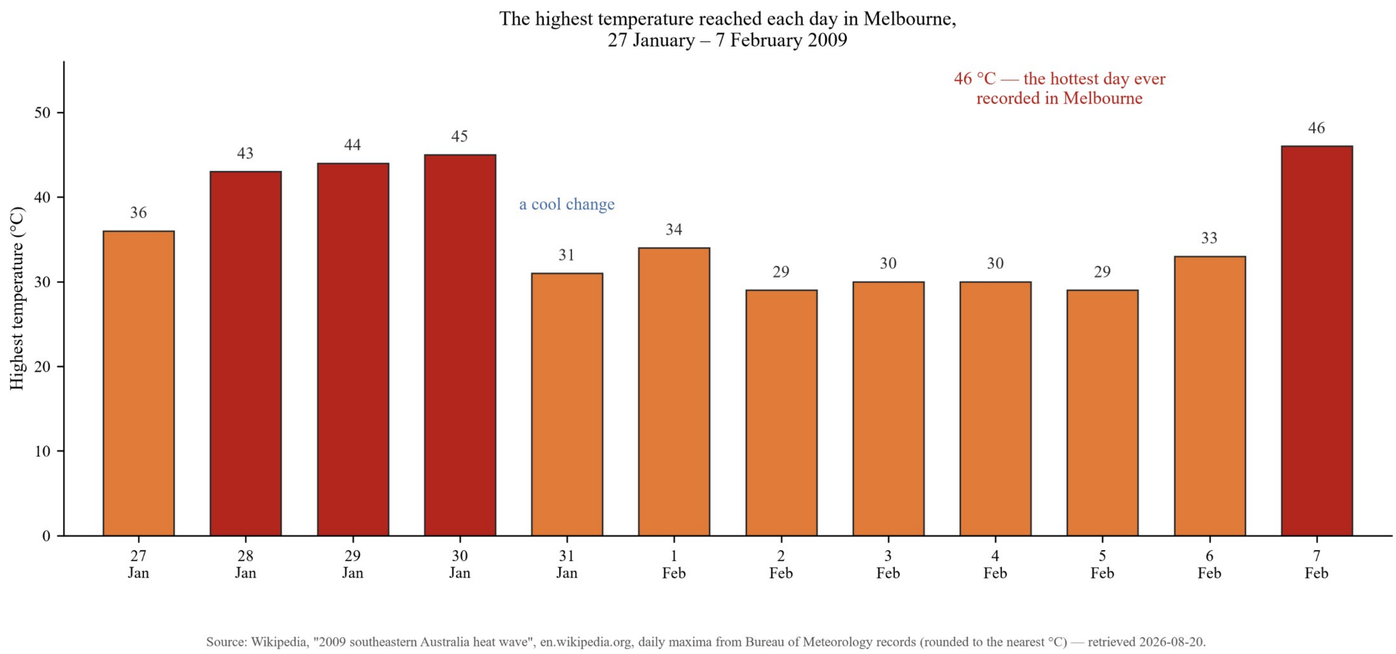
Source: Bureau of Meteorology, mean annual rainfall: Cape Otway station 090015 (163 years of record), Laverton station 087031 (85 years of record), Walpeup station 076031 (80 years of record), bom.gov.au — retrieved 2026-08-20.

Cape Otway, right on the coast, gets 895 mm of rain in a mean year. Walpeup, far away in the dry inland, gets only 285 mm. Cape Otway gets more than three times as much rain as Walpeup! Different places have different climates.

Weather events

Sometimes the weather is stronger than usual. A **weather event** is a time when powerful weather arrives — a storm, a flood, a heatwave or a bushfire. A **drought** is a long, dry time with much less rain than usual (you met this word in 5B). Weather events make big changes.

Heatwaves. A heatwave is a stretch of days that are much hotter than usual. In 2009, Melbourne had one of the hottest heatwaves on record. These real numbers show the highest temperature reached each day.



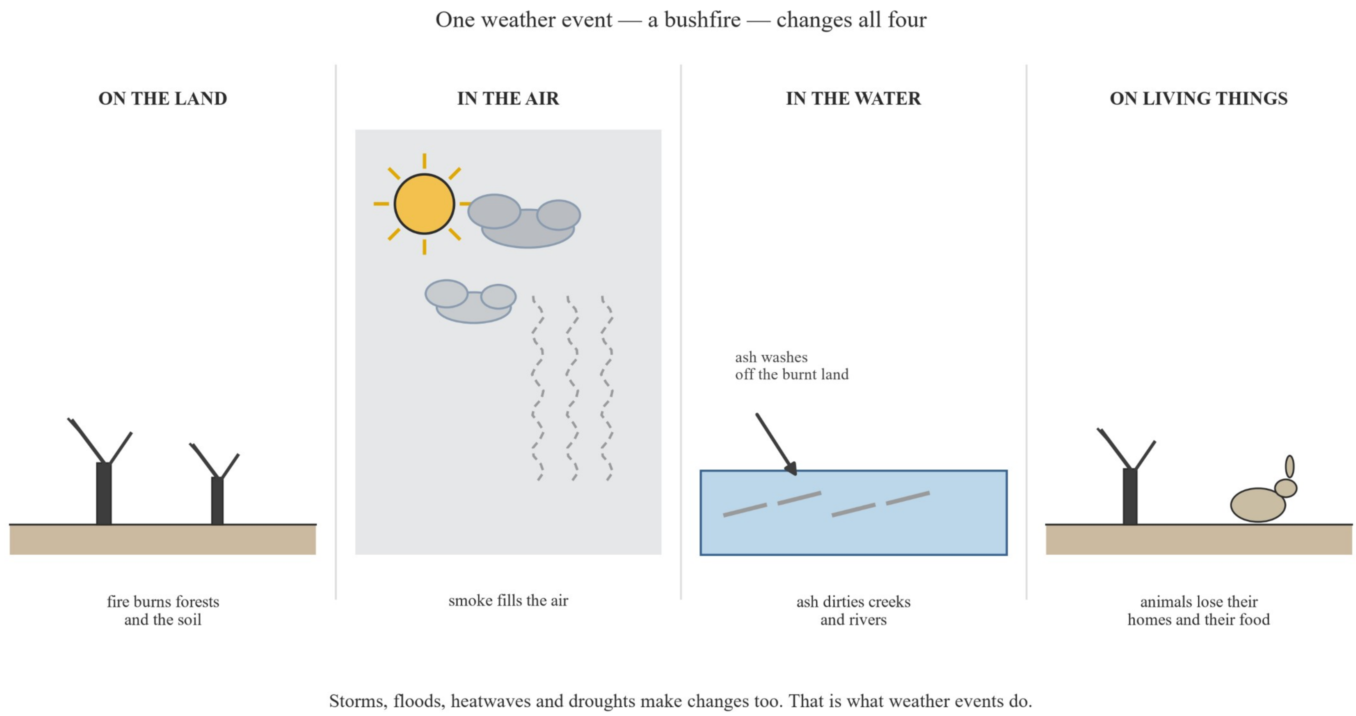
A column graph of the highest temperature reached each day in Melbourne from 27 January to 7 February 2009, with days of 40 °C or more in red, a cool change in the middle of the stretch, and the last column at 46 °C labelled the hottest day ever recorded in Melbourne

Source: Wikipedia, “2009 southeastern Australia heat wave”, en.wikipedia.org, daily maxima from Bureau of Meteorology records (rounded to the nearest °C) — retrieved 2026-08-20.

Three days in a row passed 40 °C. Then a cool change brought the temperature down. But at the end of the stretch, on 7 February, the temperature shot back up to 46 °C — the hottest day ever recorded in Melbourne, since records began in 1855. That same day, the Black Saturday bushfires burned in parts of Victoria.

Source: Wikipedia, “Black Saturday bushfires”, en.wikipedia.org — retrieved 2026-08-20.

What do weather events change? A weather event can change four things: **the land, the air, the water and living things**. Look at how one weather event — a bushfire — changes all four.

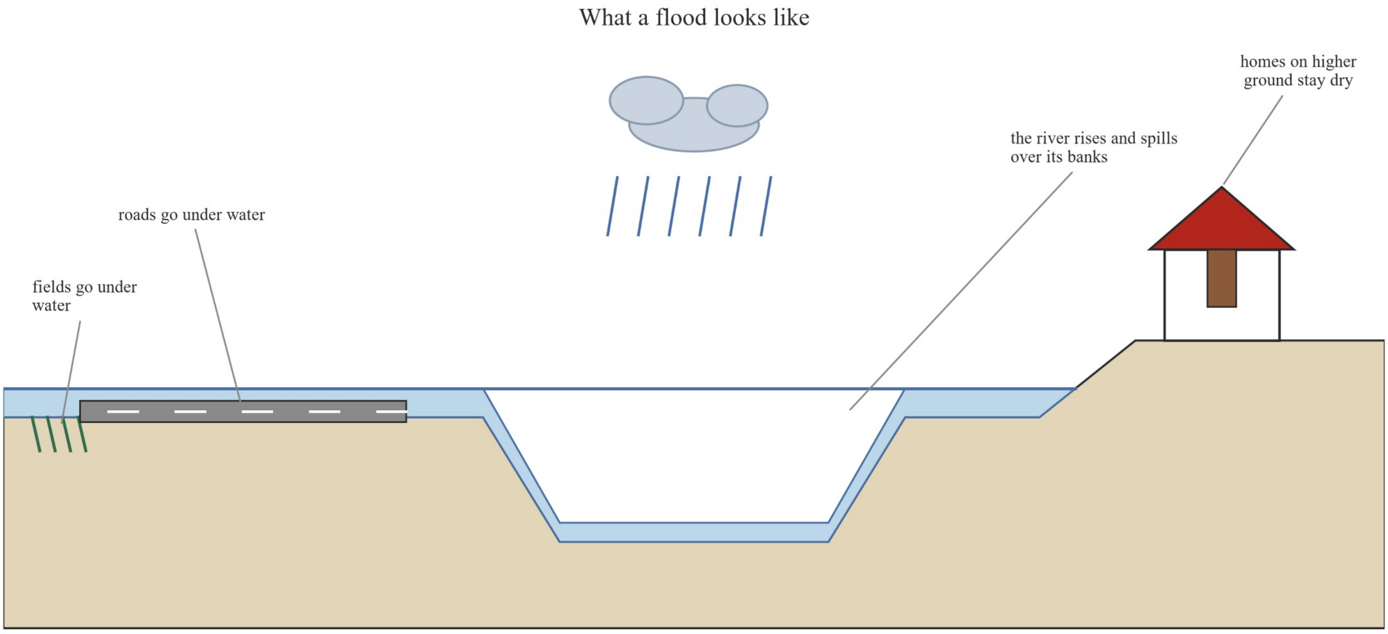


Four panels showing what a bushfire changes: on the land, burnt trees and soil; in the air, smoke rising; in the water, ash washing off the burnt land into a creek; and on living things, an animal moving away from its burnt home

- **On the land:** the fire burns forests and the soil.
- **In the air:** smoke fills the air, and the sun looks red and dim.
- **In the water:** when rain comes, ash washes off the burnt land and dirties creeks and rivers.
- **On living things:** animals lose their homes and their food.

Storms, floods, heatwaves and droughts make changes too — to the same four things.

Floods. A flood happens when heavy rain makes a river rise faster than the water can drain away. The river spills over its banks.

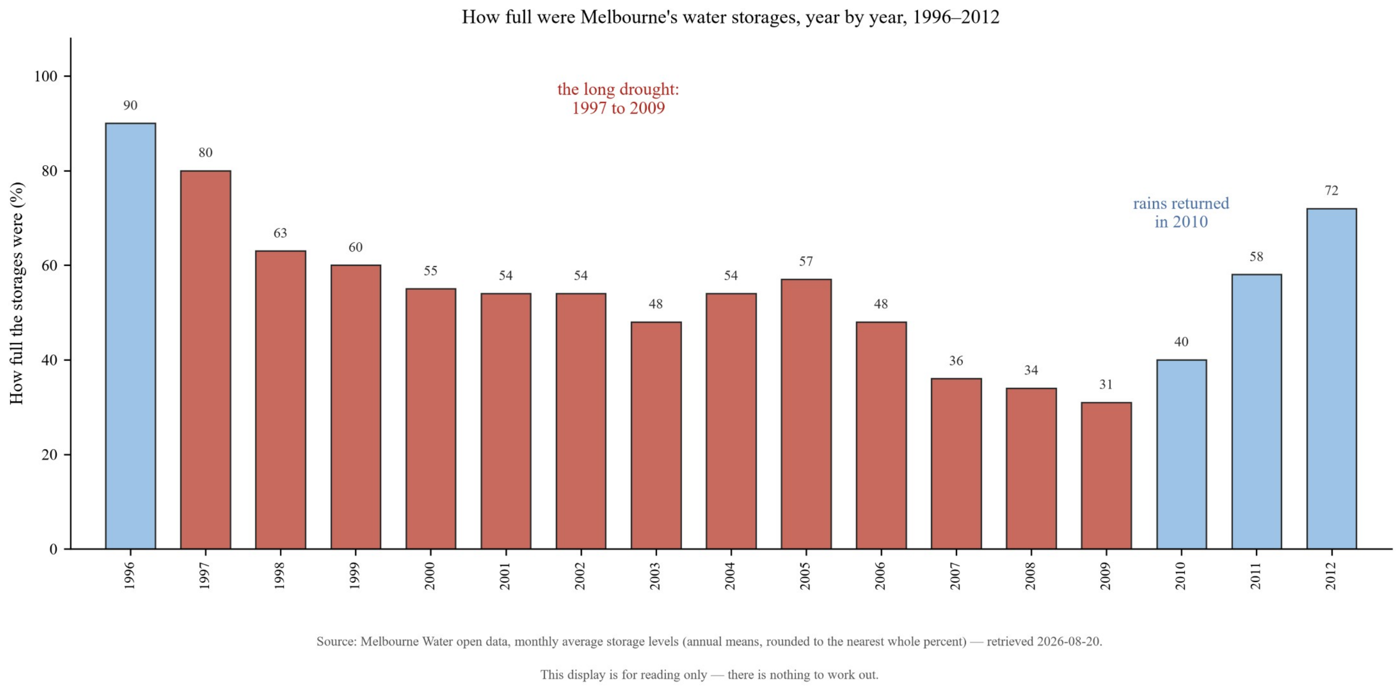


Floods happen when heavy rain makes rivers rise faster than the water can drain away.

A labelled flood scene: rain falling from a cloud, a river risen over its banks, a road and fields under water, and a home on higher ground staying dry

In a flood, roads go under water, and fields go under water. Homes on higher ground stay dry. Floods change the land, the water, and the lives of people and animals.

Droughts. A drought is different from a storm or a flood. It does not arrive in a day. It lasts for years. From about 1997 to 2009, south-eastern Australia went through a long drought. These real numbers show how full Melbourne's water storages were, year by year.



A column graph of how full Melbourne's water storages were each year from 1996 to 2012, falling from about 90 per cent in 1996 to about 31 per cent in 2009, then rising again after rains returned in 2010; the drought years are drawn in one colour and the other years in another, and a note says the display is for reading only

Source: Melbourne Water open data, monthly average storage levels (annual means, rounded to the nearest whole percent) — retrieved 2026-08-20.

You met these storages in 5B. In the wet year of 1996 they were about 90% full. Then the drought came. With much less rain than usual for so long, the storages went down and down, to about 31% full in 2009. In 2010 the rains came back, and the storages began to fill again.

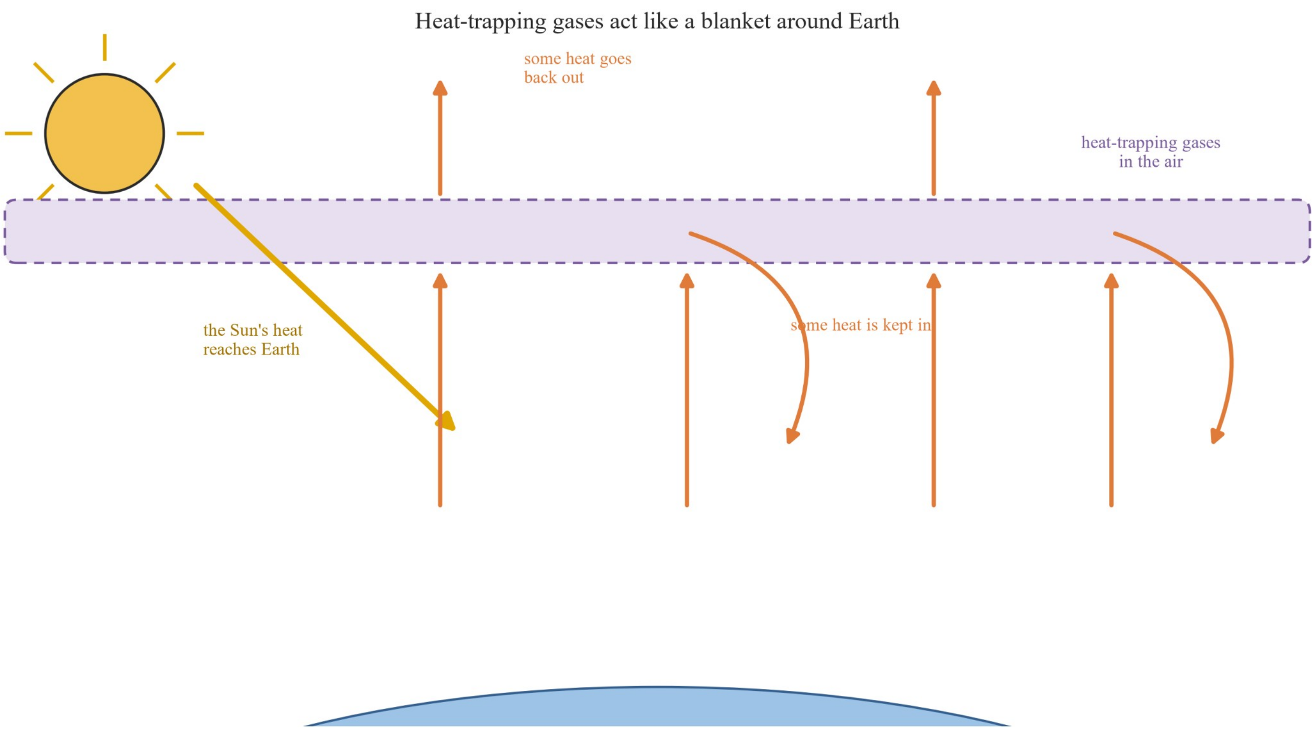
Source: Wikipedia, "2000s drought in Australia", en.wikipedia.org — retrieved 2026-08-20.

(These numbers use the percent sign, %. You only need to **read** them — you never have to work anything out with them.)

A drought shows how a dry climate time can change **water** — creeks run low, farms need water for crops and animals, and towns have to save water. It changes the land, and the living things on it, too.

Can people change the climate?

The climate can change on its own, over a long time. But people can change it too. To see how, first think about a blanket.



The more heat-trapping gases in the air, the more heat is kept in — like a thicker blanket.

A diagram of Earth with the Sun shining on it: the Sun’s heat reaches Earth, some heat goes back out, and a band of heat-trapping gases in the air keeps some heat in, like a blanket around Earth

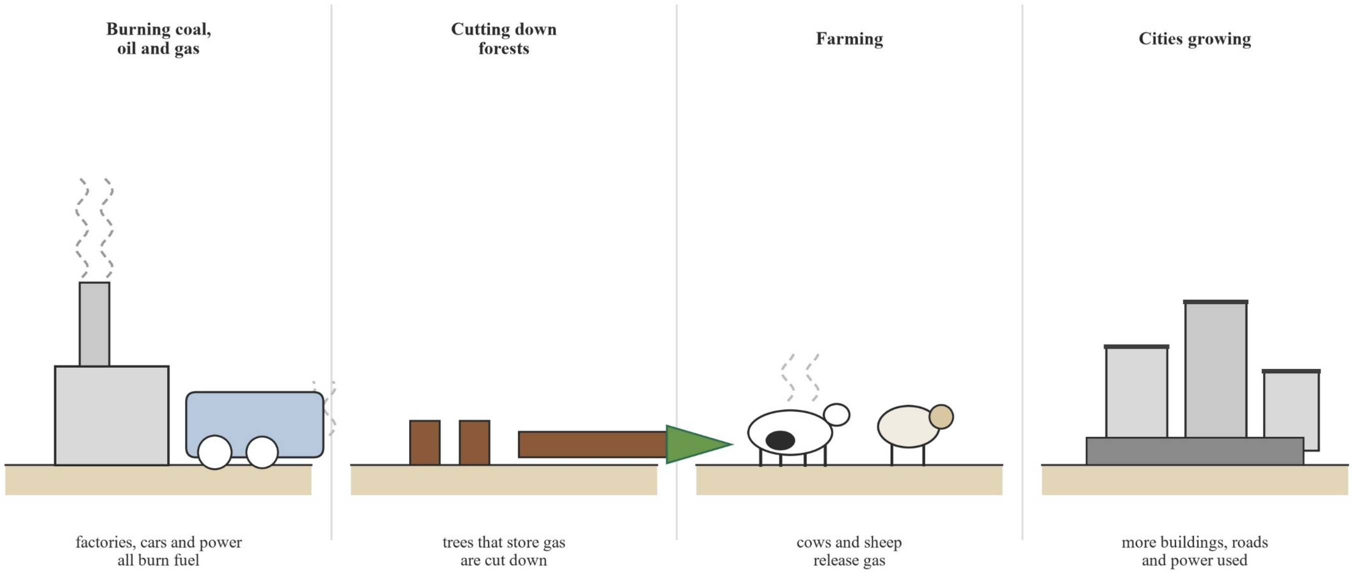
The Sun’s heat reaches Earth. Some of that heat goes back out into space. But some gases in the air keep some of the heat in, the way a blanket keeps you warm at night. These gases are called **heat-trapping gases**.

Here is the important part: **the more heat-trapping gases in the air, the more heat is kept in** — like a thicker blanket. More gas means Earth gets hotter.

Four ways people add heat-trapping gases

People’s activities add heat-trapping gases to the air. Here are four big ways.

Four ways people add heat-trapping gases to the air



These activities change the amount of heat-trapping gases in the air — and that changes the climate.

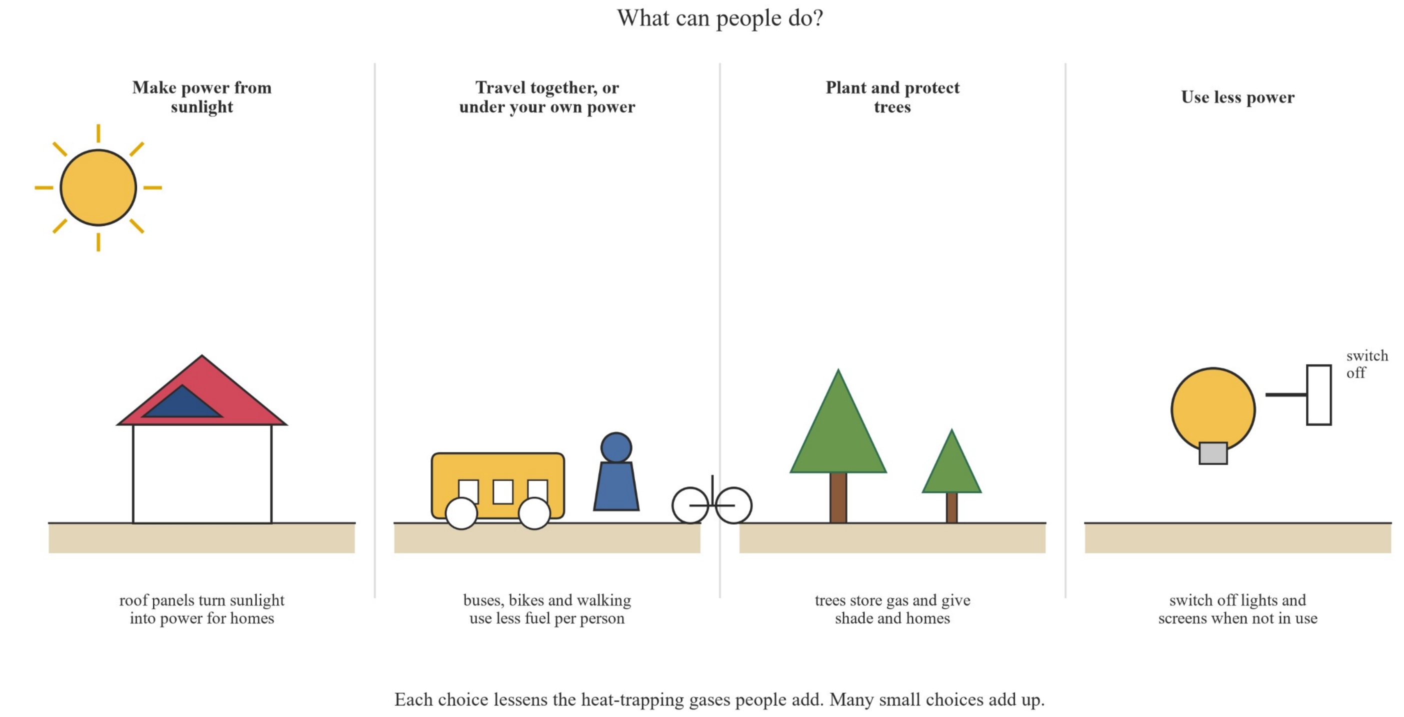
Four panels showing ways people add heat-trapping gases to the air: burning coal, oil and gas in factories, cars and power; cutting down forests; farming, with cows and sheep releasing gas; and cities growing, with more buildings, roads and power used

1. **Burning coal, oil and gas.** Factories, cars and power stations burn these fuels to make things move and work. Burning them puts heat-trapping gases into the air. It also makes **pollution** — smoke and waste gases that dirty the air.
2. **Cutting down forests.** Trees take in heat-trapping gas and store it. When forests are cut down or burned, the stored gas goes back into the air — and there are fewer trees left to take the gas in. Cutting down forests is called **deforestation**.
3. **Farming.** Farms grow our food. Cows and sheep release heat-trapping gas as their food breaks down inside them. Farming — growing crops and raising animals — is called **agriculture**.
4. **Cities growing.** More people means more houses, more buildings and more roads, and more power used. When a city grows like this, the growing is called **urbanisation**.

All four activities do the same thing in the end: they add heat-trapping gases to the air. More gas means a thicker blanket. More heat is kept in, and the climate changes.

What can people do about it?

Here is the good news. Every way people add gas has a matching way to cut it down.



Four panels showing what people can do: roof panels making power from sunlight; a bus, a bike and a person walking for travel; planting and protecting trees; and switching off lights and screens to use less power

- **Make power from sunlight.** Roof panels can turn sunlight into power for homes, so less power comes from burning fuel. In Victoria, the Solar Homes Program from the Victorian Government helps families put roof panels on their homes.

Source: Solar Victoria, About us — Solar Homes Program (solar.vic.gov.au) — retrieved 2026-08-20.

- **Travel together, or under your own power.** A bus carries many people with less fuel per person than a car. Bikes and walking use no fuel at all.
- **Plant and protect trees.** Trees take in and store the gas. Every tree helps.
- **Use less power.** Switch off lights and screens when you are not using them. Less power used means less fuel burned.

Each choice lessens the heat-trapping gases people add. One choice is small. Many small choices, made by many people, add up.

Worked examples

Worked example 1 — Is each one weather, or climate?

(a) It is raining in Geelong this afternoon.
(b) The wettest months near Melbourne are usually in spring.
(c) Monday was 24 mm wet, and then the week stayed dry.
(d) Cape Otway gets about 895 mm of rain in a mean year.

Working	Comment
(a) One place, one afternoon — a short time.	Short times are **weather**.
(b) “Usually” and “the wettest months” mean a pattern over many years.	The usual pattern is **climate**.
(c) One week, day by day.	Days and weeks are **weather**.
(d) A mean year is worked out from many years of records.	Many years of records give the **climate**.

Worked example 2 — Use the Melbourne (Olympic Park) rain graph for 10–16 August 2026. (a) Which day was the wettest? (b) How much rain came down over the whole week? (c) How many days had no rain at all?

(a) The tallest column is Monday, at 24 mm. (b) Add the columns: 24 + 4 = **28**. Only Monday and Tuesday had rain. (c) Count the zero columns: Wednesday to Sunday — **5** days.

∴ Monday was the wettest day, the week had 28 mm of rain in all, and 5 days had no rain.

Worked example 3 — Use the Laverton mean monthly rainfall graph. (a) Which month is the wettest? (b) Which month is the driest? (c) How much more rain falls in the wettest month than in the driest month? (d) What season is the wettest month in, in Victoria?

(a) The tallest column is **October**, at 56 mm. (b) The shortest column is **March**, at 34 mm. (c) Subtract: 56 − 34 = **22**. (d) October is in **spring** in Victoria.

∴ October is the wettest month and March the driest, with 22 mm more rain in October, and October is spring in Victoria.

Worked example 4 — Mia watched the rain in her street last week. "It rained every day last week," she says, "so the climate of Melbourne is getting wetter." What is wrong with Mia's idea?

Working	Comment
Mia's records cover one week.	One week is a short time — that is **weather**.
Climate is the usual pattern over about 30 years of records.	One wet week cannot show a change in climate.
To see whether the climate is changing, we need many years of records — not one week.	Mia measured weather, but she made a claim about climate.

∴ Mia saw one week of weather. A week is too short to say anything about climate, which is worked out from about 30 years of records.

Practice questions

Scaffolded

Q1. Copy and finish each sentence with one word. (a) What the air is like on one day is the ______. (b) What the weather is usually like at a place, over many years, is its ______.

Q2. About how many years of weather records do we look at to work out a place's climate?

Q3. Name the weather-station tool that (a) measures how hot or cold the air is, and (b) catches the rain so we can measure it.

Q4. True or false? (a) The weather can change fast. (b) A place's climate changes from one day to the next.

Q5. Use the Melbourne (Olympic Park) rain graph. (a) Which day was the wettest? (b) How much rain came down that day?

Q6. Use the Laverton mean monthly rainfall graph. Which month is (a) the wettest, and (b) the driest?

Q7. Name two weather events.

Q8. Fill in the gap: gases in the air that keep heat in, the way a blanket keeps you warm, are called heat-______ gases.

Unscaffolded

Q9. Explain the difference between weather and climate. Use the idea of time in your answer.

Q10. Weather events make changes to four things. List all four.

Q11. Choose one weather event. Tell one change it makes to the land, one to the air, one to the water, and one to living things.

Q12. Use the 2009 heatwave graph. (a) On which day did Melbourne reach its hottest temperature? (b) What was that temperature? (c) Find a day in the middle of the stretch when the temperature dropped. What do we call that kind of day?

Q13. Use the Melbourne water storages graph. (a) About how full were the storages in 2009, at the end of the drought? (b) What happened to the storages from 2010 on, and why?

Q14. Explain the blanket idea. What do heat-trapping gases do, and what happens when there is more of them in the air?

Q15. List the four ways people add heat-trapping gases to the air that you met in this subtopic.

Q16. For two of the four ways from Q15, give one thing people can do to cut that effect down.

Q17. "Planting trees helps the climate." Is this true? Use what you know about trees and gas to explain your answer.

Q18. Sort these into two groups — choices that cut down heat-trapping gases, and choices that add to them: riding a bike instead of going by car; leaving the lights on in every room; planting trees in the school yard; burning more coal to make power.

Answers

Q1. (a) weather; (b) climate.

Q2. About 30 years.

Q3. (a) A thermometer; (b) a rain gauge.

Q4. (a) True; (b) false — climate is the usual pattern over about 30 years, so it does not change day to day.

Q5. (a) Monday; (b) 24 mm.

Q6. (a) October; (b) March.

Q7. Any two of: storm, flood, heatwave, bushfire, drought.

Q8. trapping.

Q9. See worked answers.

Q10. The land, the air, the water, and living things.

Q11. See worked answers.

Q12. (a) 7 February; (b) 46 °C; (c) 31 January — a cool change.

Q13. (a) About 31% full; (b) they began to fill again, because the rains came back in 2010.

Q14. See worked answers.

Q15. Burning coal, oil and gas; cutting down forests (deforestation); farming (agriculture); and cities growing (urbanisation).

Q16. See worked answers.

Q17. True.

Q18. Cut down: riding a bike, planting trees. Add to: leaving lights on, burning more coal.

Fully-worked solutions

Q1. The weather is what the air is like on one day — sun, cloud, wind, rain, hot or cold. The climate is the usual pattern of weather at a place, worked out from about 30 years of records. So: (a) weather; (b) climate.

Q2. The time ruler in this subtopic shows it: weather looks at days and weeks, and climate looks at about **30 years** of records. That 30 years is how the Bureau of Meteorology works out climate.

Q3. The weather station picture labels both tools. (a) The **thermometer** measures how hot or cold the air is. It sits in a white box with gaps, to keep it shaded. (b) The **rain gauge** — a funnel and jar — catches the rain and holds it, so we can measure how much came down.

Q4. (a) **True** — a sunny morning can turn into a rainy afternoon. Weather changes fast. (b) **False** — the climate is the usual pattern over about 30 years of records. One day's weather does not change the climate.

Q5. Read the columns. (a) The tallest column is **Monday**. (b) It reaches 24 on the scale, so **24 mm** of rain came down that day.

Q6. (a) The tallest column is **October**, at 56 mm — the wettest month. (b) The shortest column is **March**, at 34 mm — the driest.

Q7. The subtopic names five weather events: a **storm**, a **flood**, a **heatwave**, a **bushfire** and a **drought**. Any two of these is a correct answer.

Q8. The gases in the air that keep heat in are **heat-trapping gases**. More of them in the air works like a thicker blanket: more heat is kept in, and Earth gets hotter.

Q9. Start with time. **Weather** is what the air is like over a short time — hours, days and weeks. It changes fast. **Climate** is what the weather is usually like at a place, worked out from about 30 years of records. So the difference is the time we look at: a week of rain is weather; the rain a place usually gets, over many years, is its climate.

Q10. The content description of this subtopic names them. Weather events change: **the land** (a fire burns forests; a flood covers fields), **the air** (smoke fills it), **the water** (ash dirties creeks; rivers rise over their banks) and **living things** (animals lose homes and food; people have to leave flooded homes).

Q11. Take a bushfire as the model. **Land:** the fire burns forests and the soil. **Air:** smoke fills the air. **Water:** after the fire, rain washes ash off the burnt land into creeks and rivers. **Living things:** animals lose their homes and their food. A flood works too: land goes under water; the air can smell of mud and wet; rivers spill over their banks; and people and animals have to move to higher ground.

Q12. (a) The tallest column is the last one: **7 February**. (b) It reaches **46 °C** — the hottest day ever recorded in Melbourne. (c) In the middle of the stretch, on **31 January**, the temperature dropped from 45 to 30. A day like that, when cool air moves in and the temperature drops, is called **a cool change**.

Q13. (a) The column for 2009 is the shortest: about **31% full**. (b) From 2010 on, the columns get taller again — the storages began to fill. That happened because the rains came back in 2010, ending the long drought. (Remember: you only read these numbers — you never work anything out with the percent sign.)

Q14. The Sun's heat reaches Earth. Some of the heat goes back out into space, but **heat-trapping gases** in the air keep some of it in, the way a blanket keeps you warm. When there is **more** of these gases in the air, more heat is kept in — like a thicker blanket — and Earth gets hotter.

Q15. The four ways from the picture are: (1) **burning coal, oil and gas** in factories, cars and power stations; (2) **cutting down forests** — deforestation; (3) **farming** — agriculture, where cows and sheep release gas; and (4) **cities growing** — urbanisation, with more buildings, roads and power used.

Q16. Match the fix to the cause. For **burning coal, oil and gas**: make power from sunlight with roof panels, travel by bus, bike or on foot, and switch off lights and screens to use less power. For **cutting down forests**: plant new trees and protect the forests we have. For **farming and cities**: choices that use less fuel and less power cut these down too. Any one fix, matched to one cause, earns the mark.

Q17. True. Trees take in heat-trapping gas and store it. A standing tree keeps that gas out of the air. When we plant trees and protect them, more gas stays stored and less stays in the air — so less heat is kept in. That is why planting trees helps the climate. (It is also why cutting forests down has the opposite effect.)

Q18. Sort each choice by what it does to the gas in the air. **Riding a bike instead of going by car** uses no fuel, so it cuts the gas — a cut-down choice. **Planting trees** stores gas, so it cuts it too. **Leaving the lights on** wastes power, and the power often comes from burning fuel, so it adds to the gas. **Burning more coal** puts more gas straight into the air — an add-to choice. So: cut down — the bike and the trees; add to — the lights and the coal.

Words to know in 5C

Word	What it means
weather	what the air is like on one day — sun, cloud, wind, rain, hot or cold
climate	what the weather is usually like at a place, worked out from about 30 years of records
weather station	a place where tools measure the weather every day
thermometer	a tool that measures how hot or cold something is
rain gauge	a tool that catches rain so we can measure how much came down
forecast	what the weather is likely to be like soon
mean	the usual amount, worked out from many records
weather event	a time when powerful weather arrives: a storm, flood,

Word	What it means
	heatwave, bushfire or drought
heatwave	a stretch of days much hotter than usual
flood	a time when a river rises over its banks and water covers the land
bushfire	a fire that burns in forests and bush
drought	a long, dry time with much less rain than usual
heat-trapping gases	gases in the air that keep some of the Sun’s heat in, like a blanket
pollution	smoke and waste that dirty the air, water or land
deforestation	cutting down forests
agriculture	farming — growing crops and raising animals
urbanisation	cities growing, with more buildings and roads

Chapter 5 check-up — Earth and space sciences

This check-up is a piece of class work from your workbook. It is a school instrument, not a VCAA exam — Science Levels 3 and 4 has no outside exam. There is no time to beat. Take as long as you need. If you want, your teacher will read any question out to you.

Chapter 5 check-up · Codes `VC2S4U06` (5A), `VC2S4U07` (5B), `VC2S4U08` (5C)

Total: 15 marks · Part A — Questions A1 to A8 · 8 marks · Part B — Questions B1 to B3 · 7 marks

Part A questions are worth 1 mark each. Part B questions are worth 2 or 3 marks, and the marks for each part are written with the question.

Every question in this check-up points to a part of the Levels 3 and 4 achievement standard that Chapter 5 teaches. The extracts, word for word:

They explain how Earth's resources can be used in a variety of ways. — `VC2S4U06` (5A)

They list sources of water on Earth, identify key processes in the water cycle, and describe how water can cycle through the environment. — `VC2S4U07` (5B)

They distinguish between weather and climate and explain how human activity can impact climate, and how these impacts may be reduced. — `VC2S4U08` (5C)

The words in this check-up are the words you learned in Chapter 5. If you need them, the word lists are at the end of 5A, 5B and 5C.

In this check-up you will:

- name the three Earth resources (A1)
- match rock observations to their properties (A2)
- match Victorian resources to their uses (A3)
- name processes of the water cycle (A4, A6)
- read the 100-cups picture (A5)
- say how long a climate is worked out over (A7)
- sort statements into weather or climate (A8)
- give two uses of bluestone, and explain why it suits them (B1)
- construct the water cycle in order, and explain the loop (B2)
- explain how burning coal can change the climate, and one way to cut that effect down (B3)

Part A — 8 marks

Eight questions, each worth 1 mark. A question gets its mark, or no mark.

A1. *(1 mark · `VC2S4U06`)* Name the three Earth resources you learned about in subtopic 5A.

A2. *(1 mark · `VC2S4U06`)* Match each observation to the property it is about. The properties are **texture**, **colour**, **grain** and **crystal size**.

(a) "It feels smooth and round."
(b) "It is light, almost white."
(c) "It has little crystals you can see."
(d) "It is made of lots of tiny bits stuck together."

A3. *(1 mark · `VC2S4U06`)* Match each Victorian resource to its use. Draw a line from each resource to the right use.

Resources: **1.** Gold **2.** Bluestone **3.** Brown coal **4.** Granite

Uses: **A.** Statues and headstones **B.** Jewellery and coins **C.** Buildings, roads and railways **D.** Making electricity

A4. *(1 mark · `VC2S4U07`)* Water falls from the sky as rain, snow or hail. What is this process called?

A5. *(1 mark · `VC2S4U07`)* Picture all of Earth's water poured into 100 cups. About how many of the cups hold salt water?

A6. *(1 mark · `VC2S4U07`)* The water cycle has nine processes. Which one needs plants?

A7. *(1 mark · `VC2S4U08`)* About how many years of weather records do we look at to work out a place's climate?

A8. *(1 mark · `VC2S4U08`)* Sort each statement into **weather** or **climate**.

1. It is raining in Geelong this afternoon.
2. Summer is usually the hottest time of year in Melbourne.
3. Yesterday was windy, and today is sunny.
4. Cape Otway, on the coast, gets far more rain in a mean year than Walpeup, in the dry inland.

Part B — 7 marks

Three questions. B1 is worth 2 marks, B2 is worth 3 marks, and B3 is worth 2 marks. Write your answers in your own words.

B1. *(2 marks · `VC2S4U06`)* Bluestone is a dark, hard rock. People dig it out of the ground in Victoria.

(a) Give two different things bluestone is used for. (1 mark)
(b) Pick one of those uses. Explain why bluestone is a good rock for that job. (1 mark)

B2. *(3 marks · `VC2S4U07`)* Zali is making a poster of the water cycle. She writes five labels, but they are all mixed up:

precipitation · ocean · run-off · condensation · evaporation

(a) Starting from the ocean, construct the correct order for Zali's poster. Use arrows, like this: ocean → … (2 marks)
(b) Zali draws her water cycle as a loop, not a straight line. Explain why. (1 mark)

B3. *(2 marks · `VC2S4U08`)* A town's power station burns coal to make electricity. Burning coal puts heat-trapping gases into the air.

(a) Explain how the extra heat-trapping gases can change the climate. (1 mark)
(b) Give one thing people in the town can do to cut this effect down. (1 mark)

Mark record

Question	Code	Worth	Given
A1 — name the three Earth resources	`VC2S4U06`	1	
A2 — match observations to properties	`VC2S4U06`	1	
A3 — match resources to their uses	`VC2S4U06`	1	
A4 — name the falling process	`VC2S4U07`	1	
A5 — read the 100-cups picture	`VC2S4U07`	1	
A6 — the process that needs plants	`VC2S4U07`	1	
A7 — how long a climate is worked out over	`VC2S4U08`	1	
A8 — weather or climate	`VC2S4U08`	1	

Question	Code	Worth	Given
B1 — bluestone: uses, and why it suits them	VC2S4U06	2	
B2 — construct the water cycle, and explain the loop	VC2S4U07	3	
B3 — burning coal, the climate, and the fix	VC2S4U08	2	
Total		**15**	

Marking guide

Teacher guidance — Chapter 5 check-up · 15 marks. This guide is written so a teacher without a science background can mark the check-up. Every acceptable answer is written out below, and every mark is allocated per response.

About this instrument

- The check-up is a **school instrument**, not a VCAA exam. Science Levels 3 and 4 has no external examination and no external assessment.
- Completion is **untimed** — a student may take as long as they need.
- **Reading support** is permitted: the teacher may read any question aloud on request. Reading is not being assessed.
- A mark is a record that the evidence was seen. Marks are for reporting against the achievement standard, not for ranking students.

The extracts evidenced

Each question is tagged with the code it traces to. The three extracts from the Levels 3 and 4 achievement standard, quoted at the head of the check-up:

- `VC2S4U06` (5A): "They explain how Earth's resources can be used in a variety of ways."
- `VC2S4U07` (5B): "They list sources of water on Earth, identify key processes in the water cycle, and describe how water can cycle through the environment."
- `VC2S4U08` (5C): "They distinguish between weather and climate and explain how human activity can impact climate, and how these impacts may be reduced."

Marks at a glance

Part	Questions	Code	Marks
Part A	A1–A3	`VC2S4U06`	3
Part A	A4–A6	`VC2S4U07`	3
Part A	A7–A8	`VC2S4U08`	2
Part B	B1	`VC2S4U06`	2
Part B	B2	`VC2S4U07`	3
Part B	B3	`VC2S4U08`	2
		Total	**15**

General marking rules

- Accept answers in the student's own words. The acceptable answers below are wide by design — if the response shows the understanding, give the mark.
- Spelling does not lose marks.
- Part A items are marked all-or-nothing: each gets its 1 mark, or 0.
- Part B items are part-marked exactly as shown with each question.
- If an answer is right but the reason is unclear, ask the student to say more — once. If the follow-up shows the understanding, give the mark. If it shows a guess with nothing behind it, record 0 and move on without comment.

Part A — answers

A1 · `VC2S4U06` · 1 mark

- **Accept:** rocks, minerals and soils — all three.
- **Marks:** 1 for all three named; 0 otherwise.

- **Evidences:** "explain how Earth's resources can be used in a variety of ways" — the three Earth resources that 5A teaches.

A2 · `VC2S4U06` · 1 mark

- **Accept:** (a) texture, (b) colour, (c) crystal size, (d) grain.
- **Marks:** 1 for all four matched; 0 otherwise.
- **Evidences:** "observable properties" — the four properties 5A uses to observe rocks: how they feel, what colour they are, the size of their bits, and whether crystals can be seen.

A3 · `VC2S4U06` · 1 mark

- **Accept:** 1–B (gold → jewellery and coins), 2–C (bluestone → buildings, roads and railways), 3–D (brown coal → making electricity), 4–A (granite → statues and headstones).
- **Marks:** 1 for all four matched; 0 otherwise.
- **Evidences:** "explain how Earth's resources can be used in a variety of ways" — the Victorian uses taught in 5A, from the goldfields to the quarries and the Latrobe Valley.

A4 · `VC2S4U07` · 1 mark

- **Accept:** precipitation.
- **Marks:** 1 for *precipitation*; 0 otherwise.
- **Evidences:** "identify key processes in the water cycle" — water falling from the sky, as rain, snow or hail.

A5 · `VC2S4U07` · 1 mark

- **Accept:** about 97 cups. Accept "97", "about 97" or "97 cups". This is a reading job from the 100-cups picture in 5B — nothing is worked out.
- **Marks:** 1 for about 97; 0 for about 3 (that is the fresh water).
- **Evidences:** "list sources of water on Earth" — the salt-water and fresh-water split taught in 5B.

A6 · `VC2S4U07` · 1 mark

- **Accept:** transpiration — plants giving off water vapour through their leaves.
- **Marks:** 1 for *transpiration*; 0 otherwise.
- **Evidences:** "identify key processes in the water cycle" — the one of the nine processes that needs plants, which 5B says is the one students drop.

A7 · `VC2S4U08` · 1 mark

- **Accept:** about 30 years. Accept "30 years" or "about 30".
- **Marks:** 1 for about 30 years; 0 for a short time such as one week or one year.
- **Evidences:** "distinguish between weather and climate" — the time-scale difference 5C teaches: weather looks at short times, climate at about 30 years of records.

A8 · `VC2S4U08` · 1 mark

- **Accept:** 1 — weather; 2 — climate; 3 — weather; 4 — climate. Statements 1 and 3 are about one day or a couple of days (short times); statements 2 and 4 are about what is *usually* the case, worked out from many years of records.
- **Marks:** 1 for all four sorted; 0 otherwise.
- **Evidences:** "distinguish between weather and climate" — sorting by the time being talked about, the test taught in 5C.

Part B — answers

B1 · `VC2S4U06` · 2 marks

- **(a) — 1 mark.** Accept any two different uses taught in 5A: buildings and walls, as bluestone blocks (for example, the Old Melbourne Gaol and St Patrick's Cathedral); under roads and under railway tracks, crushed into blue metal; mixed into concrete. The two uses must be different — "roads" and "railways" alone count as one use (crushed blue metal under both).
- **(b) — 1 mark.** Accept any wording that joins a property of bluestone to the chosen use. Examples: *it is hard, so it stays strong under roads and railway tracks*; *it is hard, so buildings made from it stand up*; *it is hard and dark, so it makes strong, good-looking buildings*. The response must name a property (hard, strong, dark, good-looking) and say why it suits the use. A use repeated with no property gets 0.
- **Evidences:** "explain how Earth's resources can be used in a variety of ways" — a variety of uses, and the properties that make the resource useful for each, the link 5A ends on: the properties tell us the use.

B2 · `VC2S4U07` · 3 marks

- **(a) — 2 marks.** The correct order from the ocean is: ocean → evaporation → condensation → precipitation → run-off → back to the ocean.
  - *First mark:* evaporation comes first from the ocean, and condensation comes next.
  - *Second mark:* precipitation comes next, then run-off, with the run-off going back to the ocean.
- **(b) — 1 mark.** Accept any wording that says the water cycle never stops: *it goes around and around, with no start and no finish*; *the same water keeps moving through the sky, the landscape and the ocean again and again*; *a straight line would have an end, and the water cycle does not*.
- **Evidences:** "describe how water can cycle through the environment" — the order of the processes, and the loop with no start or finish, exactly as 5B teaches them.

B3 · `VC2S4U08` · 2 marks

- **(a) — 1 mark.** Accept any wording that links more heat-trapping gas to more heat kept in. Examples: *more gas means more of the Sun's heat is kept in, like a thicker blanket, so Earth gets hotter*; *the extra gas traps more heat in the air, and that changes the climate*. The response must say, in some words, that more gas → more heat kept in. "It makes pollution" with no heat idea gets 0.
- **(b) — 1 mark.** Accept any one way taught in 5C to cut the effect down: make power from sunlight with roof panels (so less power comes from burning coal); travel together by bus, or under their own power by bike or on foot; plant and protect trees, which take in and store the gas; use less power, for example switching off lights and screens. "Make the town's electricity from sunlight instead of burning coal" is a strong answer because it matches the scenario.
- **Evidences:** "explain how human activity can impact climate, and how these impacts may be reduced" — the impact half in (a), and the mitigation half in (b). Both halves are required by the achievement standard.

Total

Part A: 8 marks. Part B: 7 marks (2 + 3 + 2). **Total: 15 marks.**

Chapter 5 investigation task — Earth and space sciences

This investigation is a piece of class work from your workbook. It is a school instrument, not a VCAA exam — Science Levels 3 and 4 has no outside exam. There is no time to beat. Take as long as you need. If you want, your teacher will read any question out to you.

Chapter 5 investigation task · Codes assessed: `VC2S4I01`, `VC2S4I02`, `VC2S4I03`, `VC2S4I04`, `VC2S4I05`, `VC2S4I06` · Content context: `VC2S4U06` (5A) and `VC2S4U07` (5B)

Total: 20 marks · Part 1 — Question and prediction · 3 marks · Part 2 — Planning scaffold · 5 marks · Part 3 — Measurements · 4 marks · Part 4 — Representation · 4 marks · Part 5 — Comparison · 2 marks · Part 6 — Communication · 2 marks

You will work in a small group, with one set of equipment between you. Everyone fills in their own workbook, in their own words.

This task is one real investigation. It assesses the skills you learned in Chapters 1 and 2 — asking, planning, measuring, representing, comparing and communicating — while you do a Chapter 5 job about soil. The six extracts from the Levels 3 and 4 achievement standard that this task evidences, word for word:

> *Students pose questions to identify patterns and relationships, and make predictions based on observations.* — `VC2S4I01` (1A)
>
> *They plan investigations using planning scaffolds, identify key components of fair tests and describe how they conduct investigations safely.* — `VC2S4I02` (1B)
>
> *They use familiar classroom instruments and simple procedures to record observations and results, including formal measurements.* — `VC2S4I03` (1C)
>
> *They construct representations to organise data and information, and identify patterns and simple relationships.* — `VC2S4I04` (2A)
>
> *They compare their findings with those of others, assess the fairness of their investigations, propose further questions for investigation and draw conclusions.* — `VC2S4I05` (2B)
>
> *They communicate observations, findings and ideas for an identified purpose and audience, using scientific vocabulary and digital tools where appropriate.* — `VC2S4I06` (2C)

The words in this task are words you already know from Chapters 1, 2 and 5. If you need them, the word lists are at the end of 1A, 1B, 1C, 2A, 2B, 2C, 5A and 5B.

In this task you will:

- pose a question you can investigate, and make a prediction based on an observation (Part 1)
- fill in a planning scaffold for a fair test, with a hazard and its control (Part 2)
- estimate first, then measure and record, in a table you design (Part 3)
- construct a column graph of your measurements, and read the pattern off it (Part 4)
- compare your findings with another group's, judge the fairness of your test, and ask a further question (Part 5)
- communicate your findings to the school gardener, using your science words (Part 6)

The job

Your class has three soils to test: **sand**, **clay** and **soil from the school yard**. Sand is soil made of very small bits of rock. Clay is a soil that feels sticky when it is wet. Your job is to find out **which of the three soils lets the most water through**.

Read this first. After a heavy night of rain, Mia looked around the school yard. On the bare clay patch, a puddle sat all morning. In the sandy garden bed, the water was gone by lunch.

What you need

One set for your group:

- three samples of soil: sand, clay, and soil from the school yard
- three funnels, and three clear cups of the same size
- a little cotton wool, to plug each funnel so the soil cannot fall through
- a measuring cup marked in millilitres (mL)
- a jug of water
- a spoon, to put the same amount of soil in each funnel
- a timer or a clock
- a tray to work on, and paper towels

Work safely

- Wear gloves when you handle the soils. Soil can hold sharp little bits that hurt.
- Wash your hands with soap and water after handling soil.
- Do not put soil or water near your mouth. No tasting, ever.
- Wipe up any spilt water at once, so nobody slips.
- Work on the tray, and clean up when you finish.
- Your teacher watches the whole time.

Part 1 — Question and prediction · 3 marks

Three questions, each worth 1 mark. A question gets its mark, or no mark.

1. *(1 mark · `VC2S4I01`)* Write the job as a question you can investigate with the three soils and the water.

2. *(1 mark · `VC2S4I01`)* Make a prediction. Which soil do you think will let the most water through?

3. *(1 mark · `VC2S4I01`)* What observation is your prediction based on?

Part 2 — Planning scaffold · 5 marks

A planning scaffold is a starting frame with the parts of a plan ready to fill in — you met it in 1B. Fill in every row. The five rows are questions 4 to 8, and each row is worth 1 mark. Remember the fair-test rule: only one thing changes, and everything else stays the same.

Plan row	Worth	Your plan
What we change	1 mark	
What we keep the same (write two things)	1 mark	
What we look for	1 mark	
Our steps, in order	1 mark	
Safely: one hazard and its control	1 mark	

Part 3 — Estimate, measure, record · 4 marks

Four questions, each worth 1 mark. Follow the steps below, in order. Your teacher will show you the equipment first.

1. Plug each funnel with a little cotton wool.
2. Put the same amount of soil in each funnel — one soil in each.
3. Stand each funnel on its own cup.
4. **Estimate first, before you pour.** For each soil, estimate how much water, in mL, will run through the soil and collect in the cup. Write your estimates in your table.
5. Pour 100 mL of water into the first funnel. Start the timer.
6. Wait two minutes. Pour the water that collected in the cup into the measuring cup. Read it at eye level, and record it in your table.

7. Do the same for the other two soils. Same cups, same 100 mL of water, same two-minute wait.

9. *(1 mark · `VC2S4I03`)* Design your results table **before** the data arrives. It needs a title, one row for each soil, and a column for the estimate and a column for the measure — with the unit (mL) in each heading.

10. *(1 mark · `VC2S4I03`)* Write your estimate for each soil in your table, before you pour any water.

11. *(1 mark · `VC2S4I03`)* Do the test. Measure the water that collected in each cup, and record each measure in your table.

12. *(1 mark · `VC2S4I03`)* Write every measure as a whole number with its unit, like **65 mL**.

Part 4 — Show your results · 4 marks

Question 13 is worth 2 marks. Questions 14 and 15 are worth 1 mark each.

13. *(2 marks · `VC2S4I04`)* Construct a column graph of your measures.

(a) Draw the two axes and label them. Put the three soils along the bottom axis, and the water that ran through (mL) up the side axis. Give the graph a title, and choose a scale that fits your biggest number. (1 mark)

(b) Draw one column for each soil, as tall as its number on the scale. Write the number on top of each column. (1 mark)

14. *(1 mark · `VC2S4I04`)* What pattern does your graph show?

15. *(1 mark · `VC2S4I04`)* Which soil held the most of the water you poured? How do your measures show that?

Part 5 — Compare and judge · 2 marks

Two questions, each worth 1 mark. Another group in your class did the same test. Your teacher will put you next to them so you can look at each other's tables.

16. *(1 mark · `VC2S4I05`)* Compare your findings with the other group's findings. Were they the same or different? If they were different, give one thing that could have caused the difference.

17. *(1 mark · `VC2S4I05`)* Was your test fair? Say one thing you would do to make it fairer. Then write one further question that your results raise.

Part 6 — Tell the gardener · 2 marks

Two questions, each worth 1 mark. The school gardener is making a new garden bed. The gardener wants a soil that holds water, so the plants do not dry out fast.

18. *(1 mark · `VC2S4I06`)* Write a short message to the gardener. Say which of your three soils to use, and why. Remember your purpose — to help the gardener choose — and your audience — the gardener.

19. *(1 mark · `VC2S4I06`)* Use at least two science words from Chapters 1, 2 or 5 in your message, the right way.

Mark record

Question	Code	Worth	Given
Q1 — a question you can investigate	`VC2S4I01`	1	
Q2 — a prediction	`VC2S4I01`	1	
Q3 — the observation the prediction is based on	`VC2S4I01`	1	
Q4 — what we change	`VC2S4I02`	1	
Q5 — what we keep the same (two things)	`VC2S4I02`	1	
Q6 — what we look for	`VC2S4I02`	1	

Question	Code	Worth	Given
Q7 — the steps, in order	VC2S4I02	1	
Q8 — one hazard and its control	VC2S4I02	1	
Q9 — a results table, designed before measuring	VC2S4I03	1	
Q10 — estimates, before measuring	VC2S4I03	1	
Q11 — measurements taken and recorded	VC2S4I03	1	
Q12 — whole numbers, with the unit	VC2S4I03	1	
Q13 — a column graph of the measures	VC2S4I04	2	
Q14 — the pattern read off the graph	VC2S4I04	1	
Q15 — which soil held the most water, and how they know	VC2S4I04	1	
Q16 — comparison with another group's findings	VC2S4I05	1	
Q17 — fairness judgement, a fix, and a further question	VC2S4I05	1	
Q18 — a message for the gardener, with a reason	VC2S4I06	1	
Q19 — science words used the right way	VC2S4I06	1	
Total		**20**	

Marking guide

Teacher guidance — Chapter 5 investigation task · 20 marks. This guide is written so a teacher without a science background can set up, run and mark the investigation. Every acceptable response is written out below, and every mark is allocated per response.

About this instrument

- The investigation task is a **school instrument**, not a VCAA exam. Science Levels 3 and 4 has no external examination and no external assessment.
- Completion is **untimed** — run it across one or two lessons, and let students take as long as they need on the written parts.
- **Reading support** is permitted: the teacher may read any question aloud on request. Reading is not being assessed.
- Students work in small groups for the hands-on parts, but every student fills in their own workbook. Marks are given for the evidence in each student's own workbook.
- A mark is a record that the evidence was seen. Marks are for reporting against the achievement standard, not for ranking students.

Before you start — setting up

Per group of three or four students, gather: three funnels; three clear cups of the same size; a little cotton wool; a measuring cup marked in millilitres (mL); a jug of water; a spoon; a timer or a clock; a tray; paper towels; and gloves. The three soils: **sand** and **clay** bought for classroom use (or collected with permission), and **soil from the school yard**, collected by you, or by students wearing gloves, with permission and a trowel. Put each soil in its own labelled container.

The cotton wool plugs the funnels so the soil cannot fall into the cups. Use about the same plug in each funnel — the same plug for every soil keeps the test fair.

Pair each group with another group for Part 5 before the lesson starts.

There is no open flame, no heating and no hazardous chemical in this task. The safety controls are the ones in the student pages: gloves for soil work (`VC2S4I02.E04` names gloves for soil work), washing hands after, no tasting, and spilt water wiped up at once so nobody slips.

What usually happens

Sand lets most of the water through fast — often 50–80 mL of the 100 mL comes through in two minutes. Clay lets little through in that time — often 10–30 mL, with the rest still sitting on the soil. Soil from the school yard usually lands somewhere between. **But do not mark against these numbers.** Mark the skills: a student whose clay happens to let more water through than their sand can still earn every mark, as long as their table, graph, pattern and message follow their own measurements honestly.

The extracts evidenced

Each question is tagged with the code it traces to. The six extracts from the Levels 3 and 4 achievement standard, quoted at the head of the task:

- `VC2S4I01` (1A): "Students pose questions to identify patterns and relationships, and make predictions based on observations."
- `VC2S4I02` (1B): "They plan investigations using planning scaffolds, identify key components of fair tests and describe how they conduct investigations safely."
- `VC2S4I03` (1C): "They use familiar classroom instruments and simple procedures to record observations and results, including formal measurements."
- `VC2S4I04` (2A): "They construct representations to organise data and information, and identify patterns and simple relationships."

- `VC2S4I05` (2B): “They compare their findings with those of others, assess the fairness of their investigations, propose further questions for investigation and draw conclusions.”
- `VC2S4I06` (2C): “They communicate observations, findings and ideas for an identified purpose and audience, using scientific vocabulary and digital tools where appropriate.”

Marks at a glance

Component	Questions	Code	Marks
Question and prediction	Q1–Q3	`VC2S4I01`	3
Planning scaffold	Q4–Q8	`VC2S4I02`	5
Measurements	Q9–Q12	`VC2S4I03`	4
Representation	Q13–Q15	`VC2S4I04`	4
Comparison, fairness, further question	Q16–Q17	`VC2S4I05`	2
Communication	Q18–Q19	`VC2S4I06`	2
		Total	**20**

General marking rules

- Accept responses in the student’s own words. The acceptable responses below are wide by design — if the response shows the understanding, give the mark.
- Spelling does not lose marks.
- Mark the student’s own numbers, not the numbers you expected. The pattern, the graph and the message must follow from the student’s own table.
- If an answer is right but the reason is unclear, ask the student to say more — once. If the follow-up shows the understanding, give the mark. If it shows a guess with nothing behind it, record 0 and move on without comment.
- The hands-on conduct of the test — pouring, waiting, reading the cup at eye level — is best checked by watching the groups as you move around. Note it where you see it; the marks below are earned in the workbook.

Part 1 — Question and prediction · `VC2S4I01` · 3 marks

Q1 · 1 mark

- **Accept:** any question that can be answered by doing the test with the three soils and water. Examples: *Which soil lets the most water through — sand, clay or soil from the school yard?*; *Does sand let more water through than clay?*; *Which soil holds the most water?*
- **Marks:** 1 for a question that can be investigated with the equipment provided; 0 for a question that cannot be tested (for example, *Is soil nice?*) or for no question.
- **Evidences:** “pose questions to identify patterns and relationships” — the 1A move of turning a job into a question that a test can answer.

Q2 · 1 mark

- **Accept:** any prediction about which soil will let the most (or the least) water through, for example *I predict the sand will let the most water through*.
- **Marks:** 1 for a prediction that answers the question in Q1; 0 for no prediction, or for one that does not match the question.
- **Evidences:** “make predictions based on observations” — the prediction half; Q3 supplies the base.

Q3 · 1 mark

- **Accept:** the observation named as the base of the prediction. The strongest answer uses the task's observation: *the puddle sat on the clay patch all morning, but the water was gone from the sandy garden bed by lunch*. Also accept any observation of the student's own that points the same way, for example *I saw water sit on the clay*.
- **Marks:** 1 for an observation that could base the prediction; 0 for a guess with nothing behind it (*I just think so*) — the 1A distinction is that a prediction is grounded in an observation, and a guess is not.
- **Evidences:** "make predictions based on observations" — the base half.

Part 2 — Planning scaffold · `VC2S4I02` · 5 marks

Q4 · 1 mark

- **Accept:** the soil — sand, clay, soil from the school yard. Only the soil changes.
- **Marks:** 1 for naming the soil as the one thing that changes; 0 if more than one thing changes.
- **Evidences:** "identify key components of fair tests" — *what we change*, the first of the three fair-test parts taught in 1B.

Q5 · 1 mark

- **Accept:** any two of: the amount of soil in each funnel; the amount of water poured (100 mL); the wait (two minutes); the same cups and funnels; the same cotton-wool plug; the same measuring cup.
- **Marks:** 1 for two keep-the-sames; 0 for one or none.
- **Evidences:** "identify key components of fair tests" — *what we keep the same*, the second fair-test part.

Q6 · 1 mark

- **Accept:** how much water runs through the soil and collects in the cup, in mL. Accept any wording that points at the water that came through.
- **Marks:** 1 for a look-for that can be measured; 0 for something that cannot (for example, *how the soil looks*).
- **Evidences:** "identify key components of fair tests" — *what we look for*, the third fair-test part.

Q7 · 1 mark

- **Accept:** any workable order that treats all three soils the same way, for example: plug the funnels; put the same amount of each soil in; stand each funnel on its cup; estimate; pour 100 mL; wait two minutes; measure the water in the cup; do the same for each soil. Steps 1–7 on the student page are the full version.
- **Marks:** 1 for steps in a workable order, with each soil treated the same; 0 for steps that miss the measuring, or treat the soils differently.
- **Evidences:** "plan investigations using provided scaffolds" — the plan row that makes the test repeatable.

Q8 · 1 mark

- **Accept:** any hazard-and-control pair from the safety list: soil can hold sharp bits → wear gloves; soil and water are not for mouths → no tasting; spilt water makes a slip → wipe it up at once; dirty hands → wash them after.
- **Marks:** 1 for a hazard named with a control that stops it; 0 for a hazard with no control, or a control with no hazard.
- **Evidences:** "describe how they conduct investigations safely" — the hazard-and-control pairing taught in 1B, and gloves for soil work named in `VC2S4I02.E04`.

Part 3 — Measurements · `VC2S4I03` · 4 marks

Q9 · 1 mark

- **Accept:** a results table designed before the measuring, with a title, one row for each soil, and a column for the estimate and a column for the measure, with (mL) in each heading. For example: *Water that ran through each soil* | Soil | Estimate (mL) | Measure (mL).

- **Marks:** 1 for a complete table frame with the unit in the headings; 0 for a frame with no headings, no unit, or no estimate column.
- **Evidences:** "use familiar classroom instruments and simple procedures to record observations and results" — the 1C rule that the table is planned before the data arrives, and the unit travels with the number.

Q10 · 1 mark

- **Accept:** an estimate recorded for each of the three soils before any pouring. A sensible estimate sits between 0 and 100 mL — no more water can run through than was poured.
- **Marks:** 1 for estimates for all three soils, written before the measuring; 0 if an estimate is missing or clearly written after the measure. If an estimate sits outside 0–100 mL, ask once: *can more water run through than the 100 mL you poured?* If the student fixes it, give the mark.
- **Evidences:** the estimate-before-measure loop taught in 1C, founded by `VC2M3M01` — the estimate is the check on the measuring.

Q11 · 1 mark

- **Accept:** a measurement recorded for each of the three soils. The numbers will differ from group to group — that is expected, and correct.
- **Marks:** 1 for three measurements recorded in the table; 0 for one or two soils only.
- **Evidences:** "record observations and results, including formal measurements" — reading the measuring cup and writing what it says, even when it surprises the estimate.

Q12 · 1 mark

- **Accept:** every measurement written as a whole number with its unit — for example, *65 mL*, not *65* and not *about 65*.
- **Marks:** 1 when every measure carries the unit; 0 when any measure is missing its unit.
- **Evidences:** the 1C convention that the unit travels with the number.

Part 4 — Representation · `VC2S4I04` · 4 marks

Q13 · 2 marks

- **(a) — 1 mark.** Accept a graph with a title; the three soils labelled along the bottom axis; the water that ran through, with (mL), labelled up the side axis; and a scale that fits the biggest number (counting by 10s or 20s up to 100 usually works).
- **(b) — 1 mark.** Accept one column per soil, each as tall as its number on the scale, matching the student's own table, with the number written on top. The columns must follow the student's measurements — not the numbers you expected.
- **Evidences:** "construct representations to organise data and information" — the 2A build: axes, labels, scale, then columns; at this band a column graph, not a line graph.

Q14 · 1 mark

- **Accept:** a pattern that follows from the student's own graph, for example *the sand let the most water through, and the clay let the least*; or *the columns go down from sand to school-yard soil to clay*.
- **Marks:** 1 for a pattern that matches their data; 0 for a pattern that does not match their own table, or for none.
- **Evidences:** "identify patterns" — reading off what the graph keeps showing.

Q15 · 1 mark

- **Accept:** the soil that let the **least** water through is the one that held the most of the poured water — in most groups that is the clay — with the reason read from the measures: *only 20 mL came through the clay, so the clay held 100 − 20 = 80 mL of the water.*
- **Marks:** 1 for naming the right soil from their data and saying how the measures show it; 0 for naming the soil that let the most through, or for no reason.

- **Evidences:** “identify patterns and simple relationships” — the link between less water through and more water held, and the soil-stores-water idea taught in 5A.

Part 5 — Comparison, fairness, further question · `VC2S4I05` · 2 marks

Q16 · 1 mark

- **Accept:** the findings stated as the same or different. If the same: *both groups found the sand let the most water through, so we can feel more sure*. If different: one thing that could have caused the difference — they packed their soil differently; they waited a different time; they used different cups or a different amount of soil; they read the measuring cup a different way; their school-yard soil came from a different spot.
- **Marks:** 1 for the same-or-different call with a reason when they differ; 0 for no comparison.
- **Evidences:** “compare their findings with those of others” — the 2B move: same findings make us more sure; different findings make us ask what was different, not who was wrong.

Q17 · 1 mark

- **Accept:** all three parts. (i) A fairness judgement: *yes — only the soil changed*, or *not quite — we packed the soils differently*. (ii) One thing to make it fairer: pack each soil the same way; wait the same time for every soil; use the same 100 mL each time; do the test again and look at the tries together. (iii) One further question the results raise: *does the clay still hold the most water if we wait longer?*; *how fast does the first drip fall for each soil?*; *what happens if we mix sand and clay?*
- **Marks:** 1 for all three parts; 0 otherwise. If one part is missing, ask once — *was your test fair, and what question do you still have?* — and give the mark if the follow-up supplies it.
- **Evidences:** “assess the fairness of their investigations, propose further questions for investigation” — fairness as a judgement with a fix, and findings that raise the next question.

Part 6 — Communication · `VC2S4I06` · 2 marks

Q18 · 1 mark

- **Accept:** a short message, written for the gardener, that names the soil that let the least water through in the student’s data (in most groups the clay) and says why in words the gardener can use: *Use the clay. It let the least water through, so it holds the most water for the plants.* The message may be a note or a short talk — if spoken, record what the student said.
- **Marks:** 1 for a message that fits its purpose (help the gardener choose) and its audience (the gardener), with a reason from the findings; 0 for a soil that contradicts the student’s own data, or for no reason.
- **Evidences:** “communicate observations, findings and ideas for an identified purpose and audience” — the 2C move of shaping the same finding for the person who needs it.

Q19 · 1 mark

- **Accept:** any two science words from Chapters 1, 2 or 5 used the right way — for example *soil, sand, clay, water, soak up, held, let through, infiltration, measure, fair test, pattern, findings, estimate*.
- **Marks:** 1 for two words used correctly; 0 for one or none, or for words used the wrong way.
- **Evidences:** “using scientific vocabulary” — the chapter’s own words, doing real work in the message.

Total

Part 1: 3 marks. Part 2: 5 marks. Part 3: 4 marks. Part 4: 4 marks. Part 5: 2 marks. Part 6: 2 marks. **Total: 20 marks.**