

Science in Year 9

In Year 9, your teen will start applying science knowledge to more abstract and real-world situations as their thinking becomes more systematic and evidence based.

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Important

Draft curriculum content

This page is based on the draft Year 9 content for Science.

Consultation on this draft is now closed. Schools are not required to implement the refreshed curriculum content until the learning area is finalised.

In Year 9, your teen applies science knowledge to more abstract and real-world situations. They confidently apply scientific rules and formulas and explain how actions can impact both people and the environment. They use models to explain interactions between systems, critique scientific claims, and examine data quality closely. They learn to justify their ideas by using clear evidence and scientific reasoning. They begin to understand how science connects to society and how to make informed decisions. Their explanations demonstrate a deeper understanding and awareness of complexity. Their thinking becomes more systematic and evidence based.

Physical Science

Matter

Ideas to help at home

With your teen, you could:

- sing the Periodic Table Song
- challenge them to identify at least 10 objects in your home made of metal, and for each one, explain why that metal is used, what properties make it suitable for the job?
- read the contents labels on food packets, cleaning products and toiletry items to identify the different elements they contain.

The Periodic Table Song - YouTube (<http://youtube.com/watch?v=VgVQKCcfwnU>)

What the teacher will focus on

The teacher will focus on how all matter is composed of different types of atoms, which are called elements. These elements are arranged in a Periodic Table, which shows patterns in physical and chemical properties within each vertical group. Metals are found on the left-hand side and non-metals are on the right. Pure substances can be elements, molecules or compounds, but a mixture contains more than one type of substance.

For example, by the end of the year, your teen may be able to:

- interpret the number of each type of atom present in a given chemical formula
- match the name of an element to its atomic symbol and identify if it's a metal or non-metal from its position on the periodic table
- explain the relative proportions of elements in a compound, for example, identify that water (H_2O) contains two hydrogen atoms and one oxygen atom, and calculate the ratio of atoms in more complex compounds
- predict physical properties based on element type, and explain that metals tend to be malleable and conduct electricity, whereas non-metals are brittle and insulating
- interpret chemical formulas to work out what a compound is made of, such as counting the total atoms in a given formula.

Chemical Reactions

Ideas to help at home

With your teen, you could:

- bake a cake and compare the mixture to the cooked cake
- observe a candle as it burns and notice how it changes over time, have them record as many observations as they can
- mix some vinegar with baking soda and hold a lit match above the reaction.

What the teacher will focus on

The teacher will focus on how chemical reactions rearrange atoms into new combinations to produce products that have different properties. This may produce colour changes, the formation of a gas or solid and a heat change. These chemical reactions can be represented by word equations and play important roles in all living and non-living systems.

For example, by the end of the year, your teen may be able to:

- use observations to recognise that a chemical reaction has occurred
- describe chemical reactions with word equations
- investigate different types of chemical reactions by identifying examples of combustion, acid-base reactions, and oxidation-reduction reactions in everyday contexts, for example, burning fuel, using baking soda and vinegar, or the rusting of iron
- recognise that reactions like combustion and acid-base reactions have an important role in our everyday lives.

Motion and Forces

Ideas to help at home

With your teen, you could:

- squeeze a sponge and notice how it pushes back against your hand, try pressing lightly, then harder, and talk about how the push from the sponge changes as your push changes
- kick a ball gently and watch it move, noticing how it speeds up at the start (an unbalanced force) and then slows down (friction and air resistance) and then try it on different surfaces, such as grass, carpet or a tile or wooden floor and compare which surface slows the ball the fastest
- put an egg in a glass of water and add salt while stirring until it floats, and explain why it's easier to float in the sea than in a pool
- use a clear bottle with small holes at different heights, fill it with water, and observe how water squirts further from lower holes, showing that pressure increases with depth
- gently press and release the plunger of a sealed syringe with a finger over the tip to feel how the trapped air resists compression and pushes back.

What the teacher will focus on

The teacher will focus on how forces affect motion, including Newton's 3 laws, friction and air resistance, pressure in fluids, and how motion can be represented and explained using diagrams and graphs.

For example, by the end of the year, your teen may be able to:

- explain that forces act in pairs (equal and opposite) on interacting objects, such as when a hand pushes on a wall and the wall pushes back on the hand (Newton's 3rd Law)
- describe inertia as an object's tendency to resist changes to its motion, so it stays still or keeps moving at the same speed and direction unless an unbalanced force acts on it (Newton's 1st Law)
- relate force, mass, and acceleration by explaining that more force causes more acceleration for the same mass, and the same force causes less acceleration for a larger mass (Newton's 2nd Law)
- experiment with how unbalanced forces change an object's speed or direction, for example, observing how a soccer ball accelerates when kicked and then slows down because of friction and air resistance
- draw simple free body diagrams of a rigid body, identify the forces on it, and determine the net force to predict changes in motion
- describe velocity as the rate of change of position (with direction) and acceleration as the rate at which velocity changes
- interpret simple distance-time and velocity-time graphs to describe and compare motion
- explain that atmospheric pressure decreases as altitude increases because there is less air above and that pressure in liquids increases with depth due to the increasing weight of liquid above
- describe how upthrust (buoyancy) acts upward on objects in a fluid and that objects float when upthrust balances or exceeds their weight.

Earth Systems

Ideas to help at home

With your teen, you could:

- talk about how the total amount of water on Earth is constant, but it moves between rivers, the ocean and the atmosphere
- draw a diagram of how Earth's spheres interact
 - write the names of the 4 spheres: Atmosphere, Biosphere, Hydrosphere, Geosphere
 - add arrows or simple drawings to show how matter moves between the spheres
- participate in tree planting initiatives to capture carbon dioxide from the atmosphere or contribute to clean-ups of local waterways.

What the teacher will focus on

The teacher will focus on the cycling of matter and energy transfers within and between the earth's atmosphere, lithosphere, biosphere and hydrosphere. This will include the water and carbon cycle and their effects on our climate and the availability of clean water.

For example, by the end of the year, your teen may be able to:

- use models to explain how the different Earth spheres interact through the way matter, like water and carbon, is recycled
- recognise how the different ways that energy is transferred within these spheres affect our climate
- understand why the sun feels hotter in the tropics than at lower latitudes on Earth's surface
- recognise the important role that ocean convection currents play in determining our climate.

Biological Science

Organism Diversity

Ideas to help at home

With your child, you could:

- identify different traits in animals around you, such as cats' coat colour, dog breed traits, or different cows and their characteristics, like milking or beef types
- grow beans and compare different fertilisers to see if they make a difference in height or flowering
- see what happens to proteins with heat by cooking an egg white or finding out what happens to hair when using hair straighteners
- brainstorm all the proteins you can find in the home.

What the teacher will focus on

The teacher will focus on developing an understanding of how DNA has sections called genes that code for proteins, and how these, together with the environment, produce the final trait, known as a phenotype. These include proteins that we can see (such as hair, nails, and eye colour) and those that we cannot see (such as digestive enzymes).

For example, by the end of the year, your teen may be able to:

- describe DNA as the genetic code for all life, stored in the nucleus
- investigate how genes are sections of DNA that code for proteins
- talk about how genes and the environment work together to produce a phenotype, for example, a trait like height depends on genes and nutrition
- discuss how proteins determine an organism's traits and come in many forms like hair, enzymes, hormones, antibodies
- explain that some traits have a single gene, but other traits are influenced by many genes, for example, being able to roll your tongue is controlled by a single gene, whereas the sweetness of fruit depends on several genes
- talk about the variation that exists in populations, which can be discontinuous, like blood types in categories, or continuous with a range, like height.

Body Systems

Ideas to help at home

With your teen, you could:

- put the stem of a light-coloured cut flower into a vase of water with a dark food colouring in it, and watch the petals change colour to show transport in the stems
- chop potatoes to make chips and soak them in salty or pure water to see how it affects the structure of the potato
- make up a board game to explain what happens to a molecule of oxygen as it is transported around the body in blood, from the lungs, until it is breathed out as carbon dioxide.

What the teacher will focus on

The teacher will focus on conducting experiments and investigations into how plants and animals transport substances within themselves, and how the complexity of this transport increases as the size of the organism increases.

For example, by the end of the year, your teen may be able to:

- describe the circulatory system of mammals, with heart, blood vessels, and blood
- label a model of the circulatory system
- name some of the substances that are transported in blood, such as hormones, nutrients and waste products
- explain how substances like oxygen, carbon dioxide, glucose, water, and ions move across cell membranes by diffusion, osmosis and active transport
- explain how a high-surface area to volume ratio increases the rate of movement of substances across cell membranes
- link life processes like growth and reproduction to the respiratory and digestive systems
- draw a labelled diagram showing how plants have xylem to transport minerals and water from roots to leaves, and phloem to transport sugar made in leaves to the rest of the plant for storage and growth.

Ecosystems

Ideas to help at home

With your teen, you could:

- observe different plants and animals in the garden and see how they interact with each other
- notice how the changing seasons affect plants and animals in the garden or a nearby park, and what causes these changes
- plant a vegetable garden and plan which crops to grow for the changing seasons
- collect garden clippings and food scraps to compost or start a worm farm, and research how microorganisms break down our food waste
- turn over rotting logs to see how the conditions change from the top of the log to underneath, and look for animals and fungi living above, in, and underneath the log.

What the teacher will focus on

The teacher will focus on demonstrating how biotic (living or recently living organisms) and abiotic factors (such as temperature, wind and soil) affect organisms in an ecosystem.

For example, by the end of the year, your teen may be able to:

- explain how ecosystems are organised from the single organism to complete ecosystems
- define biotic and abiotic factors
- identify biotic and abiotic factors in different ecosystems
- describe how biotic and abiotic factors affect populations of organisms locally and globally
- reflect on how Māori observed environmental patterns over many years to decide when to plant crops, harvest and fish, and that this knowledge is called mātauranga
- draw diagrams that show the cycling of carbon, nitrogen and water through living and non-living parts of the ecosystem
- explain how nutrient and water cycling are vital for the continuation of life, including how they are stored in forests and oceans.



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