



# Module 1: Carbon

Years **F** to **10**

## Module 1 – Carbon: Alignments to the Australian curriculum outcome standards

### Introduction

WithOnePlanet’s education resources for Years F to 10 are aligned to the Australian curriculum and coordinated for whole-school integration across multiple subjects. Through five key themes, in the form of essential questions, students are encouraged to formulate lines of inquiry, to question and investigate, to review and share information and build the knowledge to make our region a more interesting, sustainable and better place.

### Learning outcomes

Key question 1: What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?

Key question 2: What are the essential questions that will foster inquiry, understanding and transfer of learning?

### Module 1: Carbon – Essential questions and key themes:

Essential questions	Key theme
1. What is carbon?	Carbon chemistry
2. What is the carbon cycle?	Biology of the carbon cycle
3. What is climate change and what role does carbon play in it?	The environmental effects of increased carbon emissions
4. What is my carbon footprint and how can I reduce it?	Reducing the impacts of increased carbon emissions – personal
5. What can be done to mitigate climate change on a regional scale?	Reducing the impacts of increased carbon emissions in the Asia-Pacific region



# Module 1: Carbon

Years **F**

**Foundation:** Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
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### Australian Curriculum: Science

Science understanding	Biological sciences	Living things have basic needs, including food and water				
	Chemical sciences	Objects are made of materials that have observable properties		Objects are made of materials that have observable properties		
	Earth and space sciences		Daily and seasonal changes in our environment, including the weather, affect everyday life			
	Physical sciences	The way objects move depends on a variety of factors, including their size and shape				
	WithOnePlanet (Additional learning outcomes)	Living things and non-living things are made up of carbon  Carbon can be found in many different forms	Carbon is part of the air, the water, the soil and all living things  Living things, such as people, can do things that put more carbon into the air	The carbon in the air affects the weather  When there is too much carbon in the air, it can make the weather different to normal	People can reduce the amount of carbon they put into the air by doing some everyday things differently	
Science as a human endeavour	Nature and development of science	Science involves exploring and observing the world using the senses				
	Use and influence of science					
Science inquiry skills	Questioning and predicting	Respond to questions about familiar objects				
	Planning and conducting	Explore and make observations by using the senses				
	Processing and analysing data and information	Engage in discussions about observations and use methods such as drawing to represent ideas				
	Evaluating					
	Communicating	Share observations and ideas				



# Module 1: Carbon

# Years 1 to 2

## Years 1 to 2: Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?	
<b>Australian Curriculum: Science</b>						
Science understanding	Biological sciences	Living things have a variety of external features				
		Living things grow, change and have offspring similar to themselves				
			Living things live in different places where their needs are met			
	Chemical sciences	Everyday materials can be physically changed in a variety of ways				
		Different materials can be combined, including by mixing, for a particular purpose				
	Earth and space sciences	Observable changes occur in the sky and landscape				
		Earth's resources including water, are used in a variety of ways				
	Physical sciences	Light and sound are produced by a range of sources and can be sensed				
		A push or a pull affects how an object moves or changes shape				
	WithOnePlanet (Additional learning outcomes)	When living things grow, change and reproduce, they are using carbon in some way to achieve this	Carbon exists in different forms in different parts of the Carbon cycle  Natural processes control the movement of carbon between parts of the carbon cycle	When there is too much or too little carbon in the air, the effects on the weather can be dramatic	People can do everyday things that add carbon to the air, prevent carbon from entering the air and take carbon out of the air	
Science as a human endeavour	Nature and development of science	Science involves asking questions about, and describing changes in, objects and events				
	Use and influence of science		People use science in their daily lives, including when caring for the environment and living things			

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# Module 1: Carbon

# Years 1 to 2

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science inquiry skills	Questioning and predicting	Respond to and pose questions and make predictions about familiar objects and events				
	Planning and conducting	Participate in different types of guided investigations to explore and answer questions, such as manipulating materials, testing ideas and accessing information sources  Use informal measurements in the collection and recording of observations, with the assistance of digital technologies as appropriate				
	Processing and analysing data and information	Use a range of methods to sort information, including drawings and provided tables  Through discussion, compare observation with predictions				
	Evaluating	Compare observations with those of others				
	Communicating	Represent and communicate observations and ideas in a variety of ways such as oral and written language, drawing and role play				



# Module 1: Carbon

Years **3 to 4**

## Years 3 to 4: Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?	
<b>Australian Curriculum: Science</b>						
Science understanding	Biological sciences		Living things can be grouped on the basis of observable features and can be distinguished from non-living things			
			Living things have life cycles			
		Living things, including plants and animals, depend on each other and the environment to survive				
	Chemical sciences	A change of state between solid and liquid can be caused by adding or removing heat				
		A change of state between solid and liquid can be caused by adding or removing heat				
	Earth and space sciences		Earth's rotation on its axis causes regular changes, including night and day			
		Earth's surface changes over time as a result of natural processes and human activity				
	Physical sciences	Heat can be produced in many ways and can move from one object to another				
			Forces can be exerted by one object on another through direct contact or from a distance		Forces can be exerted by one object on another through direct contact or from a distance	
	WithOnePlanet (Additional learning outcomes)	Pure carbon is a chemical that exists naturally in the environment in a range of different forms; these forms have different properties	Living things take and use carbon from the environment and return it to the environment in a variety of natural and man-made processes	<p>The greenhouse effect is a natural and essential process for life on Earth</p> <p>The enhanced greenhouse effect causes the Earth to heat up as a result of too much carbon being present in the atmosphere</p>	<p>I can calculate my carbon footprint, using digital technologies, by providing information about the lifestyle of myself and my family</p> <p>My carbon footprint can tell me how many planet Earths I require to sustain my current lifestyle</p>	My actions and decisions can impact on the livelihoods and lifestyles of people in other places in the Asia-Pacific region

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# Module 1: Carbon

Years **3 to 4**

## Module 1 – Carbon: Alignments to the Australian curriculum outcome standards

> Page: 2 of 2

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science as a human endeavour	Nature and development of science	Science involves making predictions and describing patterns and relationships				
	Use and influence of science	Science knowledge helps people to understand the effect of their actions				
Science inquiry skills	Questioning and predicting	With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge				
	Planning and conducting	Suggest ways to plan and conduct investigations to find answers to questions Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate				
	Processing and analysing data and information	Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends Compare results with predictions, suggesting possible reasons for findings				
	Evaluating	Reflect on the investigation, including whether a test was fair or not				
	Communicating	Represent and communicate ideas and findings in a variety of ways, such as diagrams, physical representations and simple reports				



# Module 1: Carbon

# Years 5 to 6

## Years 5 to 6: Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
<b>Australian Curriculum: Science</b>					
Science understanding	Biological sciences		Living things have structural features and adaptations that help them to survive in their environment		Living things have structural features and adaptations that help them to survive in their environment
			The growth and survival of living things are affected by the physical conditions of their environment		
	Chemical sciences	Solids, liquids and gases have different observable properties and behave in different ways			
		Changes to materials can be reversible, such as melting, freezing, evaporating or irreversible, such as burning and rusting			
	Earth and space sciences			The Earth is part of a system of planets orbiting around a star (the sun)	
		Sudden geological changes or extreme weather conditions can affect Earth's surface			
	Physical sciences	Light from a source forms shadows and can be absorbed, reflected and refracted			
			Electrical circuits provide a means of transferring and transforming electricity		Electrical circuits provide a means of transferring and transforming electricity
		Energy from a variety of sources can be used to generate electricity			
	WithOnePlanet (Additional learning outcomes)	Carbon is a chemical substance that can join chemically to other substances to form molecules such as carbon dioxide, crude oil and sugars	Humans can make use of processes in the carbon cycle to generate electricity  Some of these processes produce carbon dioxide as a by-product	When atmospheric temperatures rise, there are many consequences for the living and non-living things on the Earth	I can reduce my carbon footprint by making some simple changes to my daily life

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# Module 1: Carbon

Years **5 to 6**

## Module 1 – Carbon: Alignments to the Australian curriculum outcome standards

> Page: 2 of 2

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science as a human endeavour	Nature and development of science	Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena Important contributions to the advancement of science have been made by people in a range of cultures				
	Use and influence of science	Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives Scientific knowledge is used to inform personal and community decisions				
Science inquiry skills	Questioning and predicting	With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be				
	Planning and conducting	With guidance, plan appropriate investigation methods to answer questions or solve problems Decide which variable should be changed and measured in fair tests and accurately observe, measure and record data, using digital technologies as appropriate Use equipment and materials safely, identifying potential risks				
	Processing and analysing data and information	Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data, using digital technologies as appropriate Compare data with predictions and use as evidence in developing explanations				
	Evaluating	Suggest improvements to the methods used to investigate a question or solve a problem				
	Communicating	Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts				





# Module 1: Carbon

# Years 7 to 8

## Years 7 to 8: Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?	
<b>Australian Curriculum: Science</b>						
Science understanding	Biological sciences				There are differences within and between groups of organisms; classification helps organise this biodiversity	
		Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions				
			Cells are the basic unit of living things and have specialised structures and functions		Cells are the basic unit of living things and have specialised structures and functions	
			Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce		Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce	
	Chemical sciences	Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques				
		The properties of the different states of matter can be explained in terms of the motion and arrangement of particles		The properties of the different states of matter can be explained in terms of the motion and arrangement of particles		
		Differences between elements, compounds and mixtures can be described at the particle level		Differences between elements, compounds and mixtures can be described at the particle level		
		Chemical change involves substances reacting to form new substances				

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# Module 1: Carbon

Years **7** to **8**

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science understanding (cont.)	Earth and space sciences		Predictable phenomena of Earth, including seasons and eclipses (and tides), are caused by the relative positions of the sun, Earth and the moon			Predictable phenomena of Earth, including seasons and eclipses (and tides), are caused by the relative positions of the sun, Earth and the moon
		Some of Earth's resources are renewable, but others are non-renewable				
		Water is an important resource that cycles through the environment				
		Sedimentary, igneous and metamorphic rocks contain minerals that are formed by processes that occur within Earth over a variety of timescales				
	Physical sciences		Change to an object's motion is caused by unbalanced forces acting on the object			
		Earth's gravity pulls objects towards the centre of the Earth				
		Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes changes within systems				
WithOnePlanet (Additional learning outcomes)	The chemical bonds between carbon atoms in molecules such as carbon dioxide, crude oil and sugars can be broken to release energy	Energy is transferred between different forms to generate electricity  The inefficiencies of energy transformations can result in the production of heat	Some of the consequences of climate change are short term and some are long term  Some of the consequences of climate change are reversible and some are permanent	I can reduce my carbon footprint by reducing my energy consumption from non-renewable resources	Countries in the Asia-Pacific region have renewable and non-renewable resources and can make individual and collective decisions about their energy sources and use	

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# Module 1: Carbon

# Years 7 to 8

## Module 1 – Carbon: Alignments to the Australian curriculum outcome standards

> Page: 3 of 3

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science as a human endeavour	Nature and Development of Science	Science knowledge changes as new evidence becomes available, and some scientific discoveries have significantly changed people's understanding of the world Science knowledge can develop through collaboration and connecting ideas across the disciplines of science				
	Use and influence of Science	Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations Science understanding influences the development of practices in areas of human activity, such as industry, agriculture and marine and terrestrial resource management People use understanding and skills from across the disciplines of science in their occupations				
Science inquiry skills	Questioning and predicting	Identify questions and problems that can be investigated scientifically, and make predictions based on scientific knowledge				
	Planning and conducting	Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safe and ethical guidelines are followed In fair tests measure and control variables, and select equipment to collect data with accuracy appropriate to the task				
	Processing and analysing data and information	Construct and use a range of representations, including graphs, keys and models, to represent and analyse patterns or relationships, using digital technologies as appropriate Summarise data from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions				
	Evaluating	Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvement to the method Use scientific knowledge and findings from investigations to evaluate claims				
	Communicating	Communicate ideas, findings and solutions to problems using scientific language and representations, using digital technologies as appropriate				



# Module 1: Carbon

# Years 9 to 10

## Years 9 to 10: Learning outcome statements (What do we want the students to KNOW, UNDERSTAND and BE ABLE TO DO?)

Key themes (Essential questions)	What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?	
<b>Australian Curriculum: Science</b>						
Science understanding	Biological sciences				Multicellular organisms rely on coordinated and independent internal systems to respond to changes to their environment	
			Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems			
				The transmission of heritable characteristics from one generation to the next involves DNA and genes		
					The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence	
	Chemical sciences	All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms				All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms
		Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed				
		Chemical reactions, including combustion and the reaction of acids, are important in both non-living and living systems and involve energy transfer				
		The atomic structure and properties of elements are used to organise them in the Periodic Table				
		Different types of chemical reactions are used to produce a range of products and can occur at different rates				

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# Module 1: Carbon

# Years 9 to 10

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science understanding (cont.)	Earth and space sciences		The theory of plate tectonics explains global patterns of geological activity and continental movement			The theory of plate tectonics explains global patterns of geological activity and continental movement
		The universe contains features including galaxies, stars and solar systems and the Big Bang theory can be used to explain the origin of the universe				
			Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere			
	Physical sciences		Forms of energy can be transferred in a variety of ways through different mediums			
			Energy conservation in a system can be explained by describing energy transfers and transformations			
		<i>The motion of objects can be described and predicted using the laws of physics</i>				
WithOnePlanet (Additional learning outcomes)	Carbon is involved in many types of chemical reactions	Carbon can be stored and sequestered, which reduces the amount of atmospheric carbon	Some of the consequences of climate change involve a tipping point. Once this tipping point is reached, the change is irreversible	Through communication and interaction with family, friends and others in my local area, our collective carbon footprints can be reduced	People in different countries in the Asia-Pacific region can collaborate to reduce the carbon footprint of the region	

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# Module 1: Carbon

Years **9 to 10**

Key themes (Essential questions)		What is carbon?	What is the carbon cycle?	What is climate change and what role does carbon play in it?	What is my carbon footprint and how can I reduce it?	What can be done to mitigate climate change on a regional scale?
Science as a human endeavour	Nature and Development of Science	Scientific understanding, including models and theories, are contestable and are refined over time through a process of review by the scientific community Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries				
	Use and influence of Science	People can use scientific knowledge to evaluate whether they should accept claims, explanations or predictions Advances in science and emerging sciences and technologies can significantly affect people's livings, including generating new career opportunities The values and needs of contemporary society can influence the focus of scientific research				
Science inquiry skills	Questioning and predicting	Formulate questions or hypotheses that can be investigated scientifically				
	Planning and conducting	Plan, select and use appropriate investigation methods, including fieldwork and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data				
	Processing and analysing data and information	Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies Use knowledge of scientific concepts to draw conclusions that are consistent with the evidence				
	Evaluating	Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems				
	Communicating	Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations				