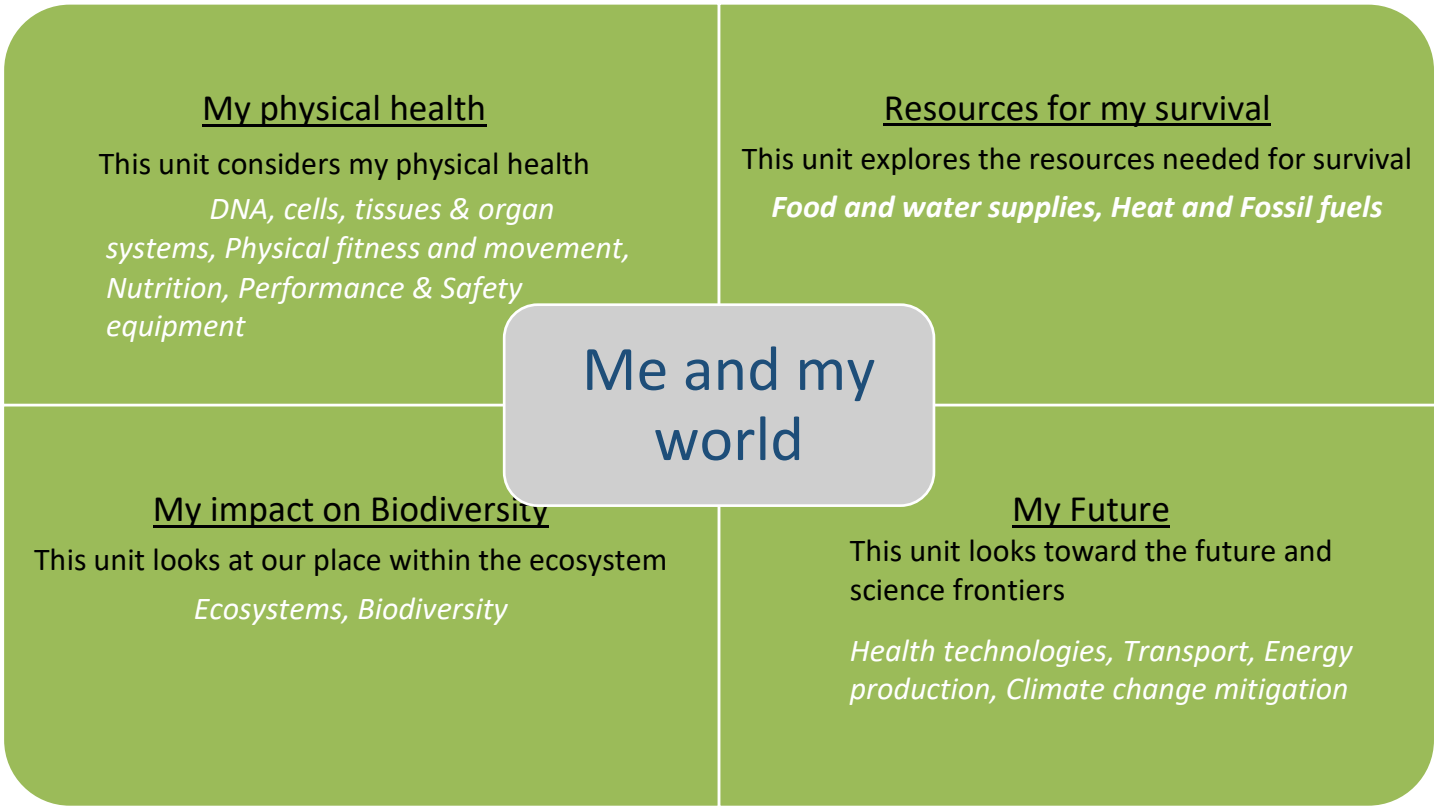
Science NCEA L1 Sample Course Outline 2 - guide to aid teacher planning

Introduction to this teaching and learning programme

This programme begins with the student and over the year expands its focus to encompass factors that might affect the student, how the student might interact with their environment, and then looks towards the student's future. It is designed to allow multiple 'strands' of science to be included in each contextual level of the programme, and also allows for multiple opportunities to weave these conceptual elements into the Nature of Science framework.



	Learning Focus	Significant learning comes by weaving together the ways of working and the "content" ideas (the Big ideas about and of Science)		Throughout the year assessment for learning happens often and evidence may be collated for summative assessment.	
		Working scientifically	Knowledge ideas	Possible Learning Activities	Suggested Assessment Opportunities
This example teaching and learning programme sequence provides a range of opportunities for teachers and/or students to select from. Students would not be expected to engage in all possible activities within one year. The four sections below might not equate to a term, as teachers could spend a longer/shorter time on aspects as appropriate to their class.					

	X week	**My physical health** ● Revisit DNA, cells, tissues & organ systems ● Physical fitness and movement ● Nutrition ● Performance & Safety equipment	Investigating: Use a range of investigations to investigate physical health Engaging: Identifying and exploring local socio-scientific issues related to physical health Human Endeavour: Explore how scientists and mātauranga practitioners have developed their understanding of physical health; and how technologies have helped with this Communicating: Examine science claims made about physical health	Matauranga pūtaiao recognises the interconnectedness of all life and the importance of life processes. DNA is the unit of inheritance and it carries information in a chemical code. Survival of individuals is dependent on interconnected processes and organ systems, and on other members of ecosystems. A force is required to change motion Newton's three laws of motion describe the relationship between force and motion. Energy is the capacity to do work.	● Exploring cells using microscopes ○ microscope development ○ history of the microscope ● DNA modelling and extraction from different plants/fruits ● Organ donation - Māori & Pasifika perspectives ● Pulse rate investigation ● Modelling of the knee joint ○ investigating changing masses on force required with/without kneecap ● Science behind the "chair challenge" ● Motion investigations ○ standing jump vs height/gender ○ strength/grip measurements ○ acceleration investigations ● Reaction rates of sprinters in blocks - sprints ● Food as fuel energy investigation ● What is in energy drinks? ● Make an energy drink equivalent by investigating and comparing products ● Modelling of particles within energy drinks ● Exploring claims made by nutrition products & companies; why energy drinks are restricted for teenagers ○ Teens and energy drinks ● Sports involvement and performance - "pushing the boundaries in sports" ○ doping, powering up, gender issues	Multiple opportunities for assessment (formative and summative), which could include: **1.1 Investigating:** ● DNA extraction ● Pulse rate ● Modelling of the knee joint ● Motion investigations ● Food as Fuel ● Energy drink comparisons ● Sweat absorption comparison of materials ● Footwear comparisons ● Reaction rates to 'starting gun' of each member in the class. **1.2 Engaging:** ● Organ donation ● Pushing the boundaries in sports Formative assessment opportunities for external assessment: **1.3 Human Endeavour:** ● Microscope development ● Development of performance and safety materials and equipments **1.4 Communicating:** ● DNA modelling ● Representing the composition of energy drinks ● Modelling particles in energy drinks ● Claims of energy drinks

					○ Endurance ○ Protective headgear - why should this be worn? ○ Endurance science ○ Article on school sport injuries in New Zealand 2019 ○ Why youth athletes are more injury prone ● Investigating different materials for sweat absorption ○ scientific development of performance and safety materials and equipment ● Investigation comparing impact of footwear on performance ○ scientific development of footwear	● Claims of nutrition products & companies

	X weeks	**Resources for my Survival** ● Food and Water supply ● Heat and Fuels	<u>Investigating:</u> Use a range of investigations to investigate food and water resources and heat and fuels <u>Engaging:</u> Identifying and exploring local socio-scientific issues related to food and water resources and heat and fuels <u>Human Endeavour:</u> Explore how scientists and mātauranga practitioners have developed their understanding of food and water resources, and heat and fuels; and how technologies have helped with this <u>Communicating:</u> Examine science claims made about food and water resources and heat and fuels	Properties of substances observable at the macroscopic level can be explained by, but are different from, the structures of atoms and molecules and the interactions between them. Rearrangements of matter (chemical reactions) can be observed at the macroscopic level and involve changes at the atomic and sub-atomic level. The total amount of matter remains the same in chemical reactions. Energy is the capacity to do work. Heat energy transfers from regions of relative warmth to colder regions. Wave motion transfers energy without transferring matter.	● Investigation of water vs sparkling water ● Visit a local nursery or market garden ● Grow microgreens ○ investigation into changing growing conditions ● Meat consumption - what is required for a balanced diet? Perspectives? ○ Science article on meat consumption & health ● Compare the "water cost" of producing meat vs vegetables ○ Water footprint of different diets ● Investigate different ways of purifying water ○ Water Purification Treatments ● Exploring the ways that heat is transferred ○ representations of heat transfer ○ making a solar oven, ○ Solar Oven link ○ traditional ways of cooking food ○ Traditional Māori cooking and preserving ○ investigation into materials that keep in/out heat ○ exploring the development of insulation in housing ● Investigate the sustainability of non-renewable energy sources ○ geothermal energy as an issue	Multiple opportunities for assessment (formative and summative), which could include: **<u>1.1 Investigating:</u>** ● Water vs sparkling water ● Changing growing conditions for microgreens ● "water cost" of producing meat vs vegetables ● ways of purifying water ● making a solar oven and investigating traditional ways of cooking ● materials that keep in/out heat ● comparison of energy produced by different fuels **<u>1.2 Engaging:</u>** ● Meat consumption & a balanced diet? Water cost of this? ● Geothermal energy as a local issue ● Impact of fossil fuel use Formative assessment opportunities for external assessment: **<u>1.3 Human Endeavour:</u>** ● Traditional ways of cooking ● Development of insulation in housing ● Development of renewable energy technologies **<u>1.4 Communicating:</u>** ● Representations of heat transfer ● Modelling through equations

					○ exploring development of renewable energy technologies ○ renewable energy technologies ● Fuels as an energy source ○ investigation into comparing energy produced by different fuels ○ modelling through equations ○ impact of fossil fuel use	● Claims about meat vs vegetarian diets **End of Term 2, summative assessment of AS 1.3 Development of science ideas and processes**

	X weeks	**My impact on biodiversity** ● Revisit ecosystems ● Why is biodiversity important? ● How am I (in terms of resources) impacting on biodiversity?	Investigating: Use a range of investigations to investigate human impact on biodiversity Engaging: Identifying and exploring local socio-scientific issues related to human impact on biodiversity Human Endeavour: Explore how scientists and mātauranga practitioners have developed their understanding of human impact on biodiversity; and how technologies have helped with this Communicating: Examine science claims made about human impact on biodiversity	Matauranga pūtaiao recognises the interconnectedness of all life and the importance of life processes. Populations (NOT individuals) adapt to their environment as a result of evolution. Genetic variation is essential for evolutionary change. Where populations cannot adapt to the rate of environmental change, extinction occurs. Ecosystems with more biological diversity are more likely to survive environmental changes which can be human induced. Mātauranga Pūtaiao expresses the existence of and the relationships between organisms and systems in the natural world through concepts such as whakapapa, mauri, tapu, noa, kaitiakitanga and derived conceptual frameworks. Changes in one sphere can cause changes to	● Exploring school grounds or further afield to investigate the biodiversity present ● Investigation - identifying and classifying species present ● Investigating threats to biodiversity ○ Threats to biodiversity ● Visit from expert (eg. DOC/council/ conservation organisation on importance of biodiversity ○ Why are we trying to be pest-free 2050? Perspectives? Aotearoa Biodiversity ○ Implications of introduced species? ○ Why does Aotearoa have a unique ecosystem? ○ Our changing ecosystems – timeline ○ Involvement of humans in species recovery/ conservation efforts ○ DOC - biodiversity ● Mātauranga Pūtaiao approach involving local iwi/mana whenua - what are traditional approaches about biodiversity and ecosystems? ○ Saving taonga ○ Kaitiakitanga - Seeing Nature As Your Elder ○ Explore a Māori framework for understanding soil health - The Mana of Soil: A Māori Cultural Perspective of Soil Health in Aotearoa-NZ &	Multiple opportunities for assessment (formative and summative), which could include: **1.1 Investigating:** ● Biodiversity present in school grounds or community location ● Identifying and classifying species present in a location ● Threats to biodiversity **1.2 Engaging:** ● Pest-free 2050 as an issue ● Human impact on biodiversity Formative assessment opportunities for external assessment: **1.3 Human Endeavour:** ● Implications of introduced species to Aotearoa NZ & historical development of ideas around this. ● Development of NZ conservation science ● Mātauranga Pūtaiao approach to biodiversity **1.4 Communicating:** ● Using keys and diagrams to classify organisms ● Claims around human impacts on biodiversity ● Representations of “pests” and “weeds”

				other spheres, often in unexpected and complex ways.	ELEVATING THE MANA OF SOIL THROUGH THE HUA PARAKORE FRAMEWORK	**At the end of Term 3, the summative assessment could be undertaken for:** **1.1 Investigating:** ● Students complete a comparison of the investigative approaches carried out during the year. **1.2 Engaging:** ● If not already done earlier in the year, students should finalise their evidence for this internal assessment.

	X weeks	**My future** ● New materials ● Health technologies ● Transport ● Energy production ● Ways to mitigate climate change (solutions focused)	Investigating: Use a range of investigations to investigate new science-based solutions, materials and technologies Engaging: Identifying and exploring local socio-scientific issues related to new science-based solutions, materials and technologies Human Endeavour: Explore how scientists and mātauranga practitioners are developing new science-based solutions, materials and technologies Communicating: Examine science claims made about new science-based solutions, materials and technologies	Wave motion transfers energy without transferring matter. Forces acting at a distance are explained in terms of fields. Properties of substances observable at the macroscopic level can be explained by, but are different from, the structures of atoms and molecules and the interactions between them. Rearrangements of matter (chemical reactions) can be observed at the macroscopic level and involve changes at the atomic and sub-atomic level. The total amount of matter remains the same in chemical reactions. The distribution of heat energy within the Earth system is dynamic, and this is affected by human activity. Changes in one sphere can cause changes to other spheres, often in	● Investigating claims of biodegradable plastics 'Biodegradable' plastic bags often don't break down ● Exploring the development of nanotechnology and ○ Nanoscience – introduction ● Exploring how superconductors were developed ● "superhuman" technologies - bionics, growing organs and ○ Hui aims to raise rate of Māori organ transplants ○ Fashioning inks to 'print' tissues ○ Impact of biotechnology on society ● Future energy sources - how are these produced, what are the possibilities and the current limitations: ○ hydrogen power ○ wave/tidal power ○ solar power ○ battery technology ● Explore the development of 5G ● Future climate change mitigations such as: ○ limiting populations ○ transport limitations ○ carbon sinks ● Explore any of a number of chemical discoveries made in Aotearoa - useful resource here: Scientific Sleuthing ● Create a unique product from blending traditional Māori and new techniques - see ideas here:	Multiple opportunities for formative assessment, which could include: **1.1 Investigating:** ● Biodegradable plastics ● Create a new product **1.2 Engaging:** ● "superhuman" technologies ● growing organs and tissues ● Solutions and mitigations to climate change **1.3 Human Endeavour:** ● Development of nanotechnology ● Development of superconductors ● Development of 5G technology **1.4 Communicating:** ● Claims of future energy sources ● Claims around 5G technology ● Representations of waves ● Representation of particles **Late Term 4, summative assessment of AS 1.4 Communicating (external)**

				unexpected and complex ways.	here: Weaving new materials with old	

Assessment Matrix

AS	Title	Int/Ext Credits	Assessment Type and Date	Assessment Elements
1.1	Use a range of scientific investigative approaches	Internal 5 credits	Collection of three investigative approaches completed and a comparison of the these approaches. By the end of T3.	Collection of three different approaches across the year from investigations listed above, which include: ● pattern seeking ● exploring and observing ● modelling ● classifying and identifying ● fair testing
1.2	Engage with a local socio-scientific issue	Internal 5 credits	Present evidence that - explains the relevant science ideas - describes perspectives on the issue - proposes and explains a response - links the ideas or perspectives and the response. By the end of Term 3	Choose ONE of the following issues: ● Organ donation ● Pushing the boundaries in sports (TASK) ● Meat consumption & a balanced diet? Water cost of this? ● Geothermal energy as a local issue (‘Te Pūngao Puia’ TASK) ● Impact of fossil fuel use ● Pest-free 2050 as an issue ● Human impact on biodiversity
1.3	Describe features of science that contribute to the development of scientific ideas and processes	External 5 credits	Common assessment activity - task set and marked by NZQA and sat individually under examination conditions End of Term 2	Practice activities in describing features of science that contribute to the development of scientific ideas and processes within: ● Microscope development ● Development of performance and safety materials and equipments ● Traditional ways of cooking ● Development of insulation in housing ● Development of renewable energy technologies

1.4	Interpret scientific claims in communicated information	External 5 credits	Common assessment task - NZQA assessment task under examination conditions End of Term 4	Practice activities in interpreting scientific claims made in communicated information about: ● DNA, cells, tissues & organ systems ● Physical fitness and movement ● Nutrition ● Performance & Safety equipment ● Food and Water supply ● Heat and Fuels ● Ecosystems, biodiversity and human impact on these ● New materials ● Health technologies ● Transport ● Energy production ● Ways to mitigate climate change