# **CB Level 1 Course Outline 2**

# Guide to aid teacher planning only – designed to be printed or viewed in A3, landscape.

## Purpose

This example Course Outline has been produced to help teachers and schools understand the new NCEA Learning and Assessment matrices. It could be used to create a year-long programme of learning. It will give teachers ideas of how the new standards might work to assess the curriculum at a particular level.

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| **Significant Learning** | **Learning activities and assessment opportunities**Throughout the year assessment for learning happens often. Evidence may also be collected for summative assessment. | **Duration** Total of 32 weeks |
| Recognise that mauri is present in all matter which exists as particles held together by attractive forces  | Chemistry in the taiao scenario: holiday job in the horticultural sector (for example with [Miro](https://www.miroberries.com/))This chemistry course will build competencies for vocational pathways that include chemistry and could incorporate a focus on work related skills such as careful measurement, tidiness, and punctuality.Familiarise yourself with the materials around you as you get started on the jobList materials/chemicals that can be found in the horticultural industry. Ask whānau about traditions with respect to growing plants and explore the concept of kaitiakitanga. Classify chemicals and materials as atoms, ions, or molecules.Explore the attractive forces that hold particles together. To demonstrate, fill water balloons with water, rub some with mineral oil and some with glycerol. Link to the use of latex gloves for health and safety in the horticulture industry – they do not protect us from all chemicals. Observe hair gel sprinkled with salt. | 2 weeks |
| Compare the structures of atoms, ions, and molecules | Construct models of atoms, ions, and molecules (diagrams, modelling clay and toothpicks).Learners compare and contrast, discussing advantages and disadvantages of their specific models. | 1 week |
| Explore patterns in melting/boiling points, conductivity, malleability, solubility, ductility, and hardness of metallic, ionic, molecular, and macromolecular materialsExplore how melting/boiling points and solubility are affected by the relative strength of attractive forces between particles Relate uses of materials to the physical properties of different types of matter | Revisit list of materials/chemicals found in the horticultural industry. Classify as metals, ionic solids, covalent molecules, and network solids. Describe whether they are made up of atoms, ions, or molecules. Test physical properties of different types of matter/material.You are given a task to spray copper to protect plants from fungusGive ākonga a piece of copper, packet of copper sulfate and a spray bottle. They explain how they would use these to protect plants from fungus – what they would do, why they would do it, and how it works on the microscopic level. Investigate the physical properties of copper and copper sulfate (solid and dissolved).* Identify the type of solid and describe the particles it is made out of.
* List the physical properties and why the solid was useful for the task at hand.
* State what property of the solid allows the solution to form.
* Explain why the solid dissolves with respect to the strength of the interactions.

You are asked to stop the soil from drying out during a dry spellModel the evaporation process. Add water to a bowl, put an empty beaker into the middle of the bowl, cover the bowl with clingfilm (slightly weighted down in the middle), leave the bowl in the sun. Give ākonga freshly planted cuttings and ask how they would keep them moist and warm with minimal effort. The best solution to the problem may result in a cutting which grows.* Explain why the water evaporates on a hot day in terms of strength of interactions.
* Explain why their suggested solution would work in terms of interactions.

While riding the quadbike in the morning, you notice that one of the wires connecting to the battery has been stripped bare. Is this a health and safety concern and should you inform your boss?MetService warns of a surprise cold snap. Your boss was unprepared and asks you to create a makeshift greenhouse for the lettuces and points to some plastic sheeting and aluminium rods. Ākonga could be provided with a variety of materials and construct a greenhouse model.Your boss wants you to apply nitrates as fertiliser to a field next to a river. You have watched the weather forecast and know that it is going to rain within a couple of hours. You are trying to convince your boss that applying nitrates now is not a good idea. What are you going to say?To celebrate everyone’s good work, the boss fires up an outdoor pizza oven/large outdoor grill and you are given the task to stir the coal from time to time. You grabbed an iron rod to stir the coal and the rod soon felt uncomfortably warm. Why? And what can you do to protect your hands?This can be supported by a teacher demonstration, eg hold different types of material into flame of Bunsen burner. Learning covered as part of this unit will contribute to assessment of CB1.4 – Demonstrate understanding of the physical properties of materials in the taiao | 10 weeks |
| Use knowledge of chemicals and their reactions to inform understanding of the mauri of the taiao and the role of kaitiakitanga Link quantities and location of chemicals to positive and negative impacts on the taiaoExplore patterns of chemical behaviour in neutralisation, combustion, and precipitation reactionsInvestigate the conservation of matter during chemical reactions. | Ākonga revisit the list of materials/chemicals found in the horticultural industry and investigate how some could react:Precipitation reactions* Ākonga can use copper sulfate (antifungal spray) dissolved in water and react with a solution of potassium or sodium phosphate to form copper phosphate which will precipitate.
* They can observe calcium hydroxide + sodium carbonate solutions reacting to form sodium hydroxide and calcium carbonate, which precipitates out. Calcium carbonate(s) can build up in water pipes and block pipes.
* Ākonga can measure the mass of two solutions, combine the solutions, watch the precipitate form and measure the mass of the combined solution after precipitate formation. They then can relate the observations to balanced equations.

Combustion reactions:* Chemicals in petrol, for example butane C4H10 are flammable and will completely combust in excess of oxygen. Limiting oxygen supply on the other hand leads to incomplete combustions. Use a demonstration and discuss photos of burning fires or show a video of [Hydrocarbon Combustion](https://www.youtube.com/watch?app=desktop&v=_wzJQFl1k9I)
* Ākonga can discuss conservation of matter using balanced equations.
* Ākonga can explore the implications for global warming.

Neutralisation reactions* Ākonga can add successive spatulas of lime to a solution of white vinegar with a few drops of universal indicator and explain what is happening.
* Bubbling CO2 (released in the combustion reaction) through an aqueous solution, makes the water acidic and lowers the pH.
* Ākonga can exhale through a straw into a dilute solution of sodium hydroxide containing a few drops of universal indicator. As they add more and more CO2 the solution becomes more and more acidic (turning from purple to yellow to green).
* Ākonga can explore the implications for ocean acidification. Relate this to the mauri of the ocean: CO2 released in a fire leads to ocean acidification, which affects the environment negatively and therefore we need to act (eg limit CO2 emissions).

Opportunity for Assessment of CB1.2 – Demonstrate understanding of a chemical reaction in the taiao |  |
| Make predictions using knowledge of patterns of chemical behaviour in neutralisation, combustion, and precipitation reactions.  | Your boss suggests that some land should be cleared of scrub by burning it. You don’t like this idea. Explain to your boss what happens when scrub is burned and what impact it has on the environment.Your boss wants to plant blueberries. Blueberries like a slightly acidic soil. How are you going to prepare the soil?Measure the soil pH and explore how acidity could be increased. On the other hand, your boss chose to plant asparagus in a field which has fairly acidic soil and now discovers that asparagus prefer a slightly more alkaline (basic) soil. What will you do?Measure the soil pH and explore how they can make it more alkaline. The micro irrigation system in the greenhouses has again clogged up. He wonders why and how he could avoid it. Explain to him what is happening and why.Your boss has become more aware of possible impacts on the environment. She charges you to come up with a way to make sure that the small stream running through the property leaves it clean. You devise a plan. Test and share your plan.Ākonga propose different actions and test some options in the lab/classroom. They can precipitate phosphates out and decant/filter the remaining solution. Nitrates will remain soluble. Water can be purified using evaporation and condensation – does that work for large amounts of water? Litter, especially plastics, can be picked up.The holidays come to an end and your boss thanks you very much for all the help and ideas you provided. He wants to see you again in the next holidays. E noho rā! | 2 weeks |
| Consider microorganisms and the taiao as an interconnected entity and explore the role of microorganisms in the taiaoExplore how mātauranga Māori and Pacific knowledges interact with microorganisms | Consider mauri and the interconnectedness of living things in the taiao. Explore where ākonga might find microorganisms in the ecosystem and what their role may be.Explore examples of ecosystem/taiao restoration. Kaitiakitanga and interconnections of all living things is explained in [Understanding Kaitiakitanga – Science Learning Hub](https://www.sciencelearn.org.nz/resources/2544-understanding-kaitiakitanga). Explore the restoration of mauri following the Rena Disaster, [Restoring mauri after the Rena disaster – Science Learning Hub](https://www.sciencelearn.org.nz/resources/809-restoring-mauri-after-the-rena-disaster).The Mauri of a river is explained in [Mātauranga Māori – that which is passed down – Science Learning Hub](https://www.sciencelearn.org.nz/videos/1930-matauranga-maori-that-which-is-passed-down).Consider guardianship and the restoration of balance, for example in the context of kauri dieback. See [Kauri Dieback – Connected 2017 Level 4](https://instructionalseries.tki.org.nz/Instructional-Series/Connected/Connected-2017-Level-4-Where-to-Next/Kauri-Dieback). | 2 weeks |
| Investigate how changes in conditions in the taiao affect microorganism growth and the mauri of the taiao, including the role of defences in protecting living organisms against harmful microorganismsExplore how mātauranga Māori and Pacific knowledges interact with microorganisms | Grow bacteria in milk and investigate conditions (eg temperature) that affect microorganism growth, measured using bromothymol blue.Grow microorganisms on food and observe hyphae, spore cases, or colonies. Use control plates and make some conclusions. Ask what makes food decompose, deriving WOW (water, oxygen, warmth). Explore ways to prevent food poisoning. Link to work in food and hospitality, inviting speakers or do online interviews of vocational ambassadors from industry to discuss food hygiene requirements.Research Pacific and Māori methodologies for food preservation (eg seaweed pouches, gourds, cold storage, drying, smoking, pickling) and explain how they stop microbes from growing. See [Pōhā: A Clever Way of Storing Food in School Journal Level 2 September 2014](https://instructionalseries.tki.org.nz/Instructional-Series/School-Journal/School-Journal-Level-2-September-2014). Explore the use of fermentation in poi, kānga or rēwena so that our Pacific and Māori students can see themselves in the teaching and learning. Investigate different preservation methods for the same food such as freezing, canning, and pickling, such as povi masima. See [Space Food in Connected 2017 L2](https://instructionalseries.tki.org.nz/Instructional-Series/Connected/Connected-2017-Level-2-Taking-Action).Engage with industries that are subject to health and safety laws regarding microorganisms, for example medical professions, food outlets, dairy farmers, horticulturalists. Use invitational speakers, zoom interviews, field trips, or LEARNZ virtual field trips.Explore the protections living things have against harmful microorganisms – for example, the immune system’s three lines of defence and natural versus artificial immunity. Research baby inoculations in Aotearoa New Zealand and address vaccination misconceptions. Invite a practice nurse to speak about vaccination programmes.Explore the use of native fruit for inhibiting microorganism growth. See [Using rongoā Māori – Science Learning Hub](https://www.sciencelearn.org.nz/resources/197-using-rongoa-maori) and [The Science of Rongoā in Connected 2015 Level 3](https://instructionalseries.tki.org.nz/Instructional-Series/Connected/Connected-2015-level-3-Fact-or-Fiction/The-Science-of-Rongoa). Consider Pacific Island plants used in [traditional medicines](https://davesgarden.com/guides/articles/view/242) and [Samoan Medicinal Plants](https://www.ctahr.hawaii.edu/adap/publications/adap_pubs/1993-1.pdf).Consider the role of Alexander Fleming in antibiotic development and find out how to take antibiotics safely.Identify the ingredients in cleaning agents used at home to control microorganisms. Investigate the effect of different cleaning agents on bacteria cultures. | 4 weeks |
| Explore how microorganisms can be beneficial or harmful. Explore how mātauranga Māori and Pacific knowledges interact with microorganisms | Explore examples of microorganisms that are beneficial or harmful to humans and other animals, as well as plants. See [The Science of Microbes – BioEd](https://www.bioedonline.org/BioEd/cache/file/9FC94B30-D832-9B09-F7725C3B51541ABF.pdf). Link to imbalance in mauri. Explore fungi, nga hekaheka benefits, such as decomposer, helpful in tattooing, food, food for kereru. Look at [references to fungi in whakatauk](https://www.sciencelearn.org.nz/resources/590-all-about-fungi)ī. See [Fungi as food and medicine – Science Learning Hub](https://www.sciencelearn.org.nz/image_maps/72-matauranga-maori-fungi-as-food-and-medicine) and [Ngā Hekaheka o Aotearoa – Huia](https://huia.co.nz/huia-services/resources-for-teachers/nga-hekaheka-o-aotearoa/).Make bread, yoghurt, or ginger beer. Link to pathways education, mushroom production, kombucha technologies, food technology as a career. Look at Pacific cultural methodologies that relate to food hygiene. See [Food Safety for Pacific People](https://www.mpi.govt.nz/dmsdocument/1192-UMU-Pasifika-Food-Safety-for-Pacific-Peoples).**Opportunity for assessment of CB1.1 - Demonstrate understanding of a microorganism in the taiao** | 2 weeks |
| Explore the diverse pathways that have brought people to the Pacific, utilising mātauranga Māori and Pacific knowledges of migration and genealogy so that all students understand their place in New Zealand | Ākonga talk to whānau to research where their family originally came from. Consider the science of migration and the evidence behind Aotearoa New Zealand’s earliest arrivals. See [Africa to Aotearoa – the longest journey – University of Otago](https://www.otago.ac.nz/allan-wilson-research/study/africa-to-aotearoa.html). [Applications booklets](https://scienceonline.tki.org.nz/Content-resources-and-rich-stories) *Discovering our Ancestors, Hawaiki*, and *Waka* are all relevant here. Explore how genomes carry the story of our origins as written in our personal DNA genome.  | 1 week |
| Examine the universal nature of the molecular structure of DNA at a basic level and examine the relationship between DNA, chromosomes, genes, and alleles  | Know that all living cells contain DNA. DNA is in the nucleus of all cells. Explore the structure of DNA – the four bases + sugar + phosphate (keep it simple) and base pairing rule. See [DNA jigsaw activity](https://cell-cell-cell.nsccreative.com/wp-content/uploads/CCC_Activity_DNAjigsaw_v01.doc) and [DNA Discovery Pack – Your Genome](https://www.yourgenome.org/sites/default/files/downloads/activities/dna-discovery-pack/yourgenome-dnadiscoverypack.pdf).Extract DNA from fruit, such as strawberries or bananas.Pair up chromosomes from a picture to make a human karyotype, then distinguish male, female, Down’s Syndrome. Observe a picture of a karyotype for another organism, compare and contrast with the human karyotype.Draw diagrams or make models to connect and differentiate the concepts of chromosomes, DNA, genes, and alleles. | 2 weeks |
| Consider mutation as a source of variation and explore the importance of variation to living things in a local context | Look at a photo of a human family. Identify similarities and differences and link to variation.Plot the variation of a feature within the class such as foot length.Compare skin colour of inner and outer arms and discuss what could be causing any variation.Explore applications of variation within an Aotearoa New Zealand or Pacific nation context, for example selective breeding in cattle, apples.Explore what a mutation is. Relate to genetic screening and single gene genetic disorders. | 1 week |
| Explore the passing down of DNA through the process of fertilisation, which creates further variationUse data and information to predict and interpret past and future inheritance and consider how this informs whakapapa | Model genetic crosses using an online interactive such as [Dragon genetics](https://learn.concord.org/geniverse). Invite farmers to speak at a visit or in an online interview about genetics on the farm.Explore genetic inheritance and fertilisation using games or models. See [Traits Bingo – Learn.Genetics](https://learn.genetics.utah.edu/content/basics/activities/pdfs/Traits%20Bingo_Public.pdf) and [An Inventory of My Traits – Learn.Genetics](https://learn.genetics.utah.edu/content/basics/activities/pdfs/InventoryOfTraits.pdf).Ākonga make a video showing how they came to be themselves – gametes, fertilisation, and simple cell division.Explore the history of genetics starting at Gregor Mendel. Identify that classical Mendelian inheritance is rare and therefore use models other than Punnett squares to show inheritance over multiple generations. Explore the use of a pedigree chart. Ākonga create a pedigree chart for one genetically based trait within their family or explore the pedigree of an animal. Ākonga talk to their own family (or the family they live with) to build up a [family health pedigree](https://www.genome.gov/Pages/Education/Modules/YourFamilyHealthHistory.pdf). | 2 weeks |
| Explore current uses of genomic information that utilise unique genomes | Use case studies on gene technologies to help ākonga identify that DNA information is unique, for example DNA fingerprinting, genetic modification, or cloning. See [Genetics on the GO – Otago University](https://blogs.otago.ac.nz/go/genetics-on-the-go/), [Genetic Modification – BBC](http://downloads.bbc.co.uk/schools/teachers/bang/series_3_4/bgtt_teacherspack_lesson_13_genetic_modification.pdf).Explore ethical issues around the use of gene technologies. Explore the many ways that scientists use genomes in their research.Use [Genetics on the G](https://blogs.otago.ac.nz/go/genetics-on-the-go/)O to run gels and discover ‘who killed the kiwi’.**Learning covered as part of this unit will contribute to assessment of CB1.3 – Demonstrate understanding of genetic variation in relation to whakapapa** | 3 weeks |