# **CB Level 1 Course Outline 4**

# 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, and 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.

## Human Biology

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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  Compare the structures of atoms, ions, and molecules  Explore patterns in melting/boiling points, conductivity, malleability, solubility, ductility, and hardness of metallic, ionic, molecular, and macromolecular substances  Relate uses of substances to the physical properties of different types of matter  explore how melting/boiling point and solubility are affected by the relative strength of attractive forces between particles.  Explore how melting/boiling point and solubility are affected by the relative strength of attractive forces between particles.  Relate uses of substances to the physical properties of different types of matter | Commence studies with an exploration of [mauri and what this means within the environment](https://www.sciencelearn.org.nz/videos/399-the-rena-disaster) and what mauri means [within the context of the body](https://www.healthnavigator.org.nz/healthy-living/t/te-whare-tapa-wh%C4%81-and-wellbeing/) as we embark on a Chemistry and Biology study of Health Sciences.  Modelling – using clay, or molymods to understand relationships between atoms, ions, and molecules.  Molecules vs ions – relate to everyday medical practices – drips, blood, haemoglobin as a molecule. Invite a lab technologist or use video conference links to discuss what ‘medical tests’ are, and to explore pathways education. Explore Te Pūkenga options for post-secondary training in lab technology.  Use models, diagrams, and animations to develop an understanding of the dissolving process. Investigate which “salts” are soluble – identify and discuss any patterns in your results. What are ‘electrolytes’? Consider their role in the human body.  Evaluate the impact of [taking large doses of water-soluble vitamins](https://www.sciencelearn.org.nz/videos/310-vitamin-c-the-antiscorbutic) and any potential consequences of high doses of fat-soluble vitamins.  Explore the concept of soluble versus insoluble, testing household antiseptics and everyday items. Invite a pharmacist to comment on the importance of solubility. Use this opportunity to discuss pathways options in this field of enterprise locally or in a tertiary training context.  Explore patterns in melting and boiling points and correlate data with graphs to identify patterns in different materials.  Carry out an investigation into factors that affect rate of evaporation, for example drying of clothes. Explain how sweating cools us down. Relate this to why we feel cold when we come out of the water on a windy day and justify this in terms of attractions between particles.  Research what materials are used as surgical implant (such as titanium alloys and polyethylene) and properties that make them suitable for this use.  Household safety can include exploration of insulators vs. conductors and properties of materials. Include OSH guidelines and explore OSH pathways. Engage local contractors such as electricians, interior designers, and manufacturers to speak via video conferencing on the properties of materials they use in their jobs. Have students interview separately and report back to class.  **Learning covered as part of this unit will contribute to the assessment of CB1.4 – Explore physical properties of materials and their use in the taiao** | 7 weeks |
| Explore patterns of chemical behaviour in reactions such as acid-base, combustion, and precipitation reactions  Make predictions using knowledge of patterns of chemical behaviour in neutralisation, combustion, and precipitation reactions  Investigate the conservation of matter during chemical reactions  Link quantities and location of chemicals to positive and negative impacts on the taiao  Use knowledge of chemicals and their reactions to inform understanding of the mauri of the taiao and the role of kaitiakitanga | Chemicals are in our body, in water, in food – explore everyday items and the chemicals in them. See background in [Chemicals Everywhere](https://www.sciencelearn.org.nz/resources/363-chemicals-everywhere).  Explore the differences in reactivity between an atom and its ion. For example, sodium in metal (reactive, will explore in flames on contact with water) vs. sodium ion (in food, stable and unreactive), or magnesium metal (burns vigorously eg in fireworks) vs. magnesium ion (reduces muscle cramps, improves sleeping). Relate this to the pattern of ion formation and position of an element on the Periodic Table.  Explore [Which chemicals are poisonous](https://www.sciencelearn.org.nz/resources/384-what-s-poisonous), What [a lethal dose means,](https://www.compoundchem.com/2014/07/27/lethaldoses/) and Why [dose makes the poison](https://www.chemicalsafetyfacts.org/dose-makes-poison-gallery/).  Consider whether ‘organic’ is necessarily safer/better – consider [this](https://jameskennedymonash.wordpress.com/category/infographics/) series of [poster](https://jameskennedymonash.wordpress.com/214/07/14/artificial-vs-natural-watermelon-sweetcorn/)s for items such as apricot kernels. Is there any difference between [chemicals made by natural or artificial processes](https://www.compoundchem.com/2014/05/19/natural-vs-man-made-chemicals-dispelling-misconceptions/)? Does it matter whether you ingest Vitamin C by a tablet chemically synthesised in a factory, or from the production of a citrus tree? Explore vitamins in Pacific foods. Consider inviting a nutritionist, pharmacist, food technologist to speak on use of chemistry in the workplace via video conferencing or use [careers nz website](https://www.careers.govt.nz/) to explore these pathways.  Identify and look for patterns in the chemical present in goods on the supermarket shelves such as foods, cleaning, and hygiene products. Consider the potential meaning of ‘chemical-free’ statements in advertising such products.  Evaluate the claims relating to [homeopathy](https://en.wikipedia.org/wiki/Homeopathy) and consider the potential impact of the extreme dilutions used. Relate this to our understanding of the ‘placebo’ effect and why we use double blind trials for evaluating any new pharmaceutical drug.  Explore some chemicals that can have both positive and negative effects, dependent on dosage or location. For example:   * fluoride in small doses improves tooth enamel hardness and reduces tooth decay, medium doses causes mottling of tooth enamel, large doses are toxic * salt (sodium chloride) is essential for our bodies but impacts on hypertension in higher doses * chlorine is an effective germicide for water supplies and pools at low doses but toxic at high doses * nitrate is a good fertiliser for pasture growth, but excess amounts cause problems with quality of water ways * lead compounds in petrol gave more efficient combustion but resulted in toxic contamination of the environment.   Research the impact of various chemicals present in rongoā (such as kawakawa, harakeke, kōwhai and mānuka) and Pacific traditional remedies. Use ākonga and whānau experiences such as use of willow (precursor of today's aspirin) and tea tree. Investigate acid base home remedies, such as treatment of bee stings versus wasp stings, or use of ongaonga (nettle).  Acid-base reactions: measure the pH of common materials – cleaners, toothpaste, lemon juice, tomato juice, milk, sodas, shampoo etc. Find out what pH measures and the effect of a log scale. Design and carry out an experiment to investigate the effectiveness of different antacids on stomach acidity.  Combustion reactions: Set up an experiment to demonstrate that CO2 is a product of the complete combustion of fuels such as ethanol. Explore how combustion of ethanol happens through a series of reactions and what happens if there is only a limited supply of oxygen (incomplete combustion)  Use balanced chemical equations to show that matter is conserved in both types of reaction. Show that the equations illustrate that less oxygen is used in incomplete combustion. Relate production of CO or C from incomplete combustion to impact on human health (carboxyhaemoglobin) and the dangers of burning fuels in enclosed spaces. Compare this to the impact of anaerobic respiration producing lactic acid/muscle pain. Related this to Pacific activities such as dance, sport and ocean traveling in traditional vessels.  Precipitate reactions: demonstrate CuSO4 + 2NaOH to show that new chemicals are made – relate this to the body as a big bag of chemicals that is constantly being added to with foods. What we put in our body will affect us. Consider Pacific foods that provide specific nutrients. Consider inviting a nutritional expert, chef, or grocer to speak about food ingredients, use using video conferencing or recorded student interview.  **Opportunity for assessment of CB1.2 – Explore chemical reactions in the taiao** | 8 weeks |
| Consider microorganisms and the taiao as an interconnected entity and explore the role of microorganisms in the taiao.  Explore how mātauranga Māori and Pacific knowledges interact with microorganisms  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 microorganisms.  Explore how mātauranga Māori and Pacific knowledges interact with microorganisms  Explore how microorganisms can be beneficial or harmful  Explore how mātauranga Māori and Pacific knowledges interact with microorganisms  Explore how mātauranga Māori and Pacific knowledges interact with microorganisms | Look at diagrams online that show the taiao and how it is viewed and represented by various groups. Think about a design for the class and the aspects of health of humans that are important – how does this link to the taiao? The mauri of the tinana is linked to [taha wairua](https://www.healthnavigator.org.nz/healthy-living/t/te-whare-tapa-wh%C4%81-and-wellbeing/)  Complete an overview of the body parts – what do we know about them? What is the role of each part, and how do they keep us healthy? Consider [careers information](https://www.careers.govt.nz/searchresults?q=health) in health care.  Consider the role that microbes have in our body and that if we consider cell number they outnumber ‘us’. Explore what we know [about](https://www.news-medical.net/health/History-of-Fecal-Transplant.aspx) [bacteria in our gut](https://www.nutripath.com.au/wp-content/uploads/2018/07/2206-Complete-Microbiome-Mapping.pdf), on our skin and discuss [rongoā Māori herbal practices](https://www.healthnavigator.org.nz/health-a-z/r/rongo%C4%81-m%C4%81ori/) that are carried out when children are ill. Explore how traditional medicines change environmental conditions to affect microorganisms in the Pacific.  Ask students to interview whānau and neighbours about practices that they use or [know of for treating infections](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3609166/).  Innoculate plates with microorganisms from skin, soil, water, and air – which had the most species?  Review articles on [microbial activity](https://www.healthnavigator.org.nz/) that are written in the language of ākonga.  Discuss how the mauri of the human body is affected by a change in bacterial number. What conditions changed in the body? How did they change and what can be done?  Discuss the term [pathogen](https://www.sciencelearn.org.nz/resources/588-bacteria-good-bad-and-ugly). Examine the [*H. pylori* story,](https://www.healthnavigator.org.nz/health-a-z/h/helicobacter-pylori/) and effects and causes of rheumatic fever. How does [traditional knowledge](https://teara.govt.nz/en/mataitai-shellfish-gathering/page-3) let us know to avoid [shellfish that may have toxins](https://www.mpi.govt.nz/dmsdocument/1058-Food-safety-for-seafood-gatherers)? What knowledge is passed down about why do we [not put our head under water in hot springs](https://www.frontiersin.org/articles/10.3389/fimmu.2019.02184/full) in the Pacific?  Consider fermentation, prebiotics, and probiotics and their use in cheese, soya sauce, kombucha and Pacific foods such as poi, kānga or rēwena.  Consider how Pacific cultures preserved food for best health.  Make foods using microorganisms or preserve foods. Link practices to the use of microorganisms. Link this to industry. For example, arrange interviews with hospitality workers, cheese makers, local artisans, or visit a food or farmers market and collect information about the small businesses.  **Opportunity for assessment of CB1.1 - Explore a microorganism within the mauri of the taiao, on Kai Production**  Consider ‘germ theory’ and the [immune system](https://www.youtube.com/watch?v=WqDJyt8vuMw). Make posters or a role play to show the elements of the system and how they work together. Consider completing a focussed enquiry with your class on the [immune system](https://www.sciencelearn.org.nz/resources/199-fighting-infection-the-immune-system-unit-plan)  Invite a speaker to talk about vaccines (in person or virtually), for example a teacher could tell a vaccine story or experience, or an elder could tell their immunisation story. Interview vaccine or border workers to understand vaccination programmes and engage in pathways conversations with health workers via video conference or class visits.  Consider practices that prevent transmission or reproduction of microbes, for example look at history of masks, hand washing, and soaps. What is used in traditional Pacific medicines? Invite health professionals such as district or community nurses, practice nurses, or midwives, to talk, share experiences, and answer questions via video conferencing or student interview to explore pathway education in community health. Engage in hospitality hygiene pathway possibilities to expose ākonga to an array of possible pathways in hygiene, cleaning, safety plans, OSH as a concept for careers.  **Opportunity for assessment of CB1.1 - Explore a microorganism within the mauri of the taiao, on Health and Disease** | 8 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 as in New Zealand  Examine the universal nature of the molecular structure of DNA at a basic level and examine the relationship between DNA, chromosomes, genes, and alleles  Consider mutation as a source of variation and explore the importance of variation to living things in a local context  Explore the passing down of DNA through the process of fertilisation, which creates further variation  Use data and information to predict and interpret past and future inheritance and consider how this informs whakapapa  Explore current uses of genomic knowledge that utilise unique genomes | Select material for class use from this [teachers resource](https://www.tandfonline.com/doi/full/10.1080/03036758.2012.673495).  Students can explore their own pepeha and those of others; this may be culture-dependent. All students can tell their stories and reflect on how they have learned their story – was it passed down through language, art, or stories – consider the culture of Aotearoa New Zealand? What is passed down genetically?  Use the resource [’Who are New Zealanders?’](https://www.otago.ac.nz/allan-wilson-research/study/africa-to-aotearoa.html) and associated resources from the Otago Uni website. Explore the [Land of Voyagers](https://www.thevoyage.co.nz/en/landing) and watch the series on the [Pacific Migration Story](https://www.mauistudios.co.nz/project/land-of-voyagers/). How does the study of genetics add to the knowledge from language and artifacts?  Recognise that genes also [tell a story](https://www.growingup.co.nz/node/636).  Learn about DNA, genes, and chromosomes. Make a model and extract DNA from kiwifruit, wheat, or cauliflower. Note that the structure remains the same, no matter what living thing is investigated.  Recognise that DNA is universal, it is made of repeating units, only four types of bases, like ‘old school’ lego – our DNA has been given to us by our ancestors.  Look at how [changes](https://www.aucklandmuseum.com/discover/collections/topics/white-kiwi-french-poodles) to the sequence of DNA can lead to things we appreciate or things that may cause harm, such as alleles for gout or haemophilia.  Look at [variation in humans](https://www.royalsociety.org.nz/research/inheritance-its-about-more-than-genes/), and all the [amazing alleles](https://www.pnas.org/content/113/10/2554) you can find and students can research.  Learn about fertilisation and how we then get variation in offspring, consider variation in siblings.  Use pedigree information to predict inheritance, look up the role of a [genetic counsellor](https://www.genomics-aotearoa.org.nz/about/genomics-and-maori/sing-aotearoa-alumni-contributing-health-genomics) and how they can help people to [use genetic](https://thespinoff.co.nz/atea/atea-otago/30-11-2018/how-whakapapa-led-to-one-doctor-losing-her-stomach-and-gaining-her-life/) information to work with [health issues](https://www.cdc.gov/genomics/stories/real_stories.htm).  Invite health professional who work in diet and nutrition to speak, or use video conferencing interviews or the [careers.nz website](https://www.careers.govt.nz/) to explore pathways in health, exercise, and dietician training and careers.  Investigate bowel screening, [breast screening](https://www.cdc.gov/genomics/stories/real_stories.htm), and [stomach cancer.](https://www.pnas.org/content/113/10/2554) Explore why we have Guthrie cards.  **Learning covered as part of this unit will contribute to the assessment of CB1.3 – Explore whakapapa using knowledge of genetic variation and inheritance** | 7 weeks |

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