Science 2.1 Carry out a practical scientific investigation with supervision

Subject content

- Your teacher will guide you on the subject of your practical investigation.
- Keep in mind the scientific investigation process.
  - Plan the investigation:
    - define the purpose
    - trial the plan
    - identify the key variables
    - select a data collection method that best suits your investigation. Your teacher will guide you.
  - Gather the data:
    - collect the data
    - record the data
    - process data – make appropriate calculations, establish a trend or pattern, consider the best way to present the data.
  - Interpret the data:
    - interpret the processed data
    - draw conclusions
    - evaluate the investigation.
  - Present your findings:
    - for this achievement standard, you are required to write a report.

Science 2.2 Research information to present a scientific report

Subject content

Your teacher will guide you on the topic or context of the research. However, it will be based on the curriculum such as an environmental issue or the development of a scientific idea or process.

- Understand the research process:
  - plan the research – this may change as you progress
  - collect information
  - process information
  - Produce a report. Your report will include a list of references that must be listed in such a way that another person can find them.

Science 2.3 Describe the factors and processes involved in the evolution of New Zealand's plants and animals

Subject content

You will have a set of resources (for example, course notes and reading references) about this subject from your teacher. Keep them up to date and don't forget to check these out.

The plants and animals of New Zealand that you may study are species of plant and animal that are endemic to New Zealand. Examples may include takahe, weta, pingao, short-tailed bat, pohutukawa, tuatara, kaka, southern rata.

Understand the factors and processes that are involved in the evolution of New Zealand's endemic plants and animals.

Factors include:

- geological factors, such as:
  - plate tectonics and the resulting effects such as the break-up of Gondwanaland.
  - changing sea levels especially in the Tertiary period
  - volcanism
  - mountain uplift
  - climatic changes especially those associated with the ice ages.

Check out how New Zealand was formed. This website also gives you information about the evolution of our most famous endemic animal – the kiwi.

Processes involved in the evolution of New Zealand plants and animals are those that affect the gene pool and could include:

- mutations
- genetic variation
- genetic isolation
- founder effect
- genetic drift
- differential selection pressures
- bottleneck effect.

Check out the information on this site about genetic variation, mutations, and genetic drift.

Science 2.5 Describe New Zealand’s geological history

Subject content

Make sure you have up-to-date course notes and don’t forget to use them. If you haven't got them see your teacher.

- Geological processes include:
  - plate tectonics (subduction and plate spreading)
  - mountain-building events (called orogenies)
  - peneplanation (the geological process of erosion of a more or less level land surface undisturbed by crustal movements).

- New Zealand’s geological events are limited to:
  - pre-Gondwanaland events
  - breakup of Gondwanaland
  - Tuhua, Rangitata, and Kaikoura orogenies and their associated rock types
  - tertiary peneplanation
  - ice ages.

Science 2.7 Describe the nature and life cycle of stars

Subject content

Make sure you have up-to-date course notes and don’t forget to use them. If you haven't got them see your teacher.

This achievement standard requires you to describe the nature of stars, that is, you will need to know different types of stars and their characteristics.

Characteristics could include:

- colour
- temperature
- size
- mass
- luminosity
- spectral type
- the relationships between the characteristics as shown by the Hertzspring Russel (HR) diagram.

The life cycle of stars will be based on the currently accepted scientific theories on life cycles and formation of stars.

Science 2.8 Describe the chemical properties and effects of fertilisers

Subject content

The purpose of this assessment is to look at general chemical principles in the context of fertilisers. Your class work will involve practical work appropriate to level two and involves a range of skills and principles. The fertilisers will include but not be limited to inorganic fertilisers, for example superphosphate, urea, ammonium nitrate, ammonium sulphate, potassium sulphate, and organic fertilisers, for example manures, blood, and bone.

The properties of fertilisers will be limited to:

- ionic bonding – in a crystal lattice
- pH – measurement, release of H+ ions
- solubility – relationship to polarity of water molecule, effect on formulation for application (eg slow release fertilisers)
- melting point and boiling point
- percentage composition
- availability of ions to plants.

Check out this site that describes the effect of soil pH on availability of nutrients.

The effects of fertilisers will be limited to the chemistry of the:

- elements in plant growth (N, P, K, S, Mg, Co, Mo, B)
- soil particle charge in holding and releasing ions
- ions in pollution and eutrophication.

Science 2.9 Use physics concepts and principles to describe the behaviour of light

Subject content

Make sure you have up-to-date course notes and don't forget to use them. If you haven't got them see your teacher.

The physics concepts and principles of light that you will be tested on will include:

- the way light travels in straight lines
- reflection from plane and spherical mirrors, $\theta_i = \theta_r$
- refraction, where one medium is air, at straight boundaries and spherical lenses
- total internal reflection
- critical angle (qualitative)
- visible spectrum as part of electromagnetic radiation, $v = f\lambda$
- refraction of light through a prism to form a spectrum
- absorption, reflection, and transmission of colour
- primary colours and colour mixing.

Learn about refraction of light. View the interactive applet that demonstrates reflection and refraction of waves (called the Huygens principle).

The context where you may learn about these concepts could include mirrors, optical glasses, binoculars, telescopes, cameras, microscopes, and the eye.

It is expected that you can use ray diagrams to determine the nature, position, and size of images.

The formulae may include:

$$\frac{1}{d_i} + \frac{1}{d_o} = \frac{1}{f}$$

$$M = \frac{d_i}{d_o} = \frac{H_i}{H_o}$$

$S_i S_o = f^2$

$W = Fd$

$p = mv$

$T = Fl_1$

$$P = \frac{E}{t}$$

$$E_k = \frac{1}{2}mv^2$$

$E_P = mg\Delta h$

$$E_s = \frac{1}{2}kx^2$$

$F = kx$

$$\text{Efficiency} = \frac{\text{Work output}}{\text{Work input}} \times 100$$

US 6352 Environmental Issue

People credited with this unit standard are able, with supervision, to gather and interpret information on, and report on, an environmental issue from a scientific perspective.

Elements and Performance Criteria

element 1

Gather information on an environmental issue from a scientific perspective.

performance criteria

1.1 The information gathered identifies the environmental issue, and is consistent with the guidelines provided.

element 2

Interpret information on an environmental issue from a scientific perspective.

performance criteria

2.1 Interpretations are consistent with the gathered information, and is consistent with the guidelines provided.

element 3

Report on the environmental issue from a scientific perspective.

performance criteria

3.1 The report is consistent with the guidelines provided.

3.2 A report is made that is consistent with the issue.

3.3 Sources of information are presented in a systematic format.

US 6383 Physics Research Project

People credited with this unit standard are able to describe how a selected physics idea has developed, and discuss how the development of a physics-based application has led to a change in society.

Elements and Performance Criteria

element 1

Describe how a selected physics idea developed.

performance criteria

1.1 The description outlines events, ideas and people significant to the development.

1.2 The description shows how the idea changed and developed in the light of ongoing experimental research.

1.3 The description uses relevant information presented in a concise manner.

element 2

Discuss how the development of a physics-based application has led to a change in society.

performance criteria

2.1 The discussion outlines the difference/s between society before and after the introduction of the application.

2.2 The discussion establishes the responsibility of the application for the identified change in society.

2.3 The discussion uses relevant information presented in a concise manner.