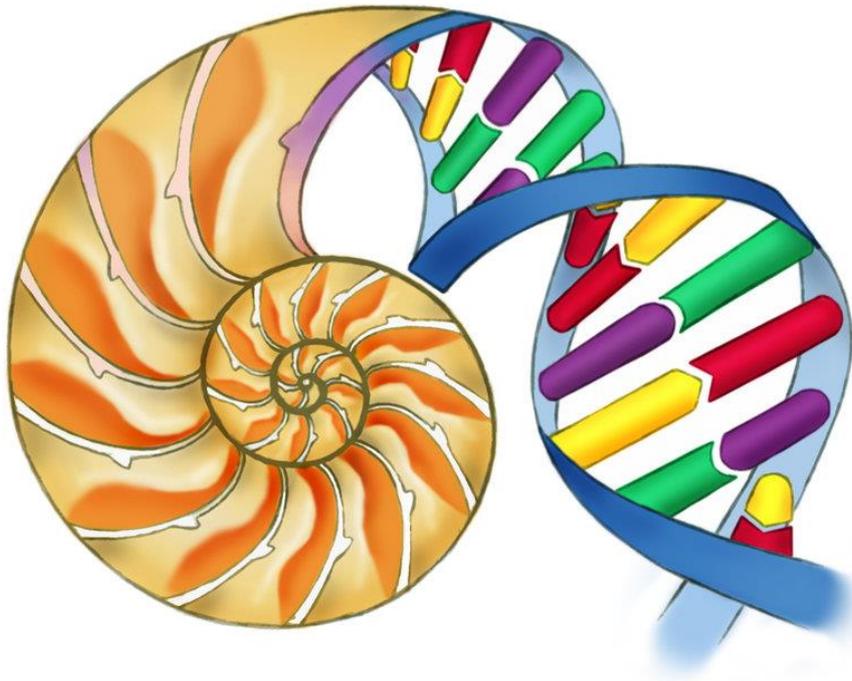


Biology 301

Koiora 301

Course Information



2016

Course Aim / Description

To provide an interesting course that could provide content knowledge leading to future studies at tertiary level.

In Biology 301 we will be offering 26 Credits from the Biology domain at NCEA level 3.

Course entry requirements: 14 Level 2 Biology credits including at least one external. Entry without these requirements may be approved on a case by case basis.

301 Biology Achievement Standards

INTERNAL assessments include:

- | | | |
|-----------------------------------|--|---|
| AS 91601 (3.1) | Carry out a practical investigation in a biological context, with guidance | 4 credits assessed by practical |
| AS 91602 (3.2)
<i>Optional</i> | Integrate biological knowledge to develop an informed response to a socio-scientific issue. | 3 credits assessed by independent research and write-up |
| AS 91604 (3.4) | Demonstrate understanding of how an animal maintains a stable internal environment. | 3 credits assessed by research and open book class write up |
| AS 91607 (3.7) | Demonstrate understanding of human manipulations of genetic transfer and its biological implications | 3 credits assessed by research and write-up |

EXTERNAL assessments include:

- | | | |
|----------------|--|-----------|
| AS 91603 (3.3) | Demonstrate understanding of the responses of plants and animals to their external environment | 5 credits |
| AS 91605 (3.5) | Demonstrate understanding of evolutionary processes leading to speciation | 4 credits |
| AS 91606 (3.6) | Demonstrate understanding of trends in human evolution | 4 credits |

Standards that contribute to University Entry (UE) Literacy

All standards from Biology 3.2 to Biology 3.7 (i.e. excluding Biology 3.1) contribute to UE Literacy requirements in **reading**.

Biology standards 3.2, 3.3, 3.5 and 3.6 (i.e. excluding Biology 3.1, 3.4 and 3.6) also contribute to UE Literacy requirements in **writing**.

Conditions of Assessment and other resources related to any of the internal achievement standards can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>.

Assessment Specifications and other resources related to any of the external achievement standards can be accessed through the Biology Resources page found at www.nzqa.govt.nz/ncea/resources.

Following is an outline of what is required in each of the available Achievement Standards.

Achievement Standard 91601 V1

Subject Reference		Biology 3.1			
Title		Carry out a practical investigation in a biological context, with guidance			
Level	3	Credits	4	Assessment	Internal
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves carrying out a practical investigation in a biological context, with guidance.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Carry out a practical investigation in a biological context, with guidance. 	<ul style="list-style-type: none"> Carry out an in-depth practical investigation in a biological context, with guidance. 	<ul style="list-style-type: none"> Carry out a comprehensive practical investigation in a biological context, with guidance.

Explanatory Note.

- 1 *Carry out a practical investigation in a biological context, with guidance* involves:
 - developing a statement of the purpose, linked to a scientific concept or idea, and written as a hypothesis
 - using a method that describes:
 - for a fair test: the independent variable and its range, the measurement of the dependent variable and the control of some other key variables
 - for a pattern seeking or modelling activity: the data that will be collected, range of data/samples, and consideration of some other key factors
 - collecting, recording, and processing data relevant to the purpose of the investigation
 - interpreting the processed data and reporting on the findings of the investigation
 - identifying relevant findings from another source
 - stating a conclusion based on interpretation of the processed data which is relevant to the purpose of the investigation.

Carry out an in-depth practical investigation in a biological context, with guidance involves:

- using a valid method that describes:
 - for a fair test: a valid range for the independent variable, the valid measurement of the dependent variable and the control of other key variables, with consideration of factors such as sampling bias and sources of errors
 - for a pattern seeking or modelling activity: a valid collection of data with consideration of factors such as sampling bias and sources of errors
- collecting, recording, and processing reliable data to enable a trend or pattern (or absence) to be determined
- stating a valid conclusion based on the processed data in relation to the purpose
- explaining the biological ideas relating to the investigation. The explanation is based on both the findings from the investigation and those from other source(s).

Carry out a comprehensive practical investigation in a biological context, with guidance involves:

- justifying the choices made throughout the investigation by evaluating the validity of the method or the reliability of the data
- stating a conclusion that discusses the biological ideas relevant to the investigation and either the findings of others, scientific principles, theories, or models.

- 2 A *practical investigation* is an activity covering the complete process: planning, carrying out, processing, interpreting data, and reporting on the investigation. It will involve the collection of primary data. It is expected that the student will have opportunity to make changes to their initial method as they work through the investigation. The nature of the investigation could be the manipulation of variables (fair test), the investigation of a pattern, or relationship, or the use of models.
- 4 *With guidance* refers to the teacher supporting the student throughout the investigation. The teacher negotiates the parameters for the investigation with the student. This may be related to suitability of organisms, equipment and resources available, and possible modifications or new directions related to the student investigative ideas. The investigative process is student driven.

Achievement Standard 91602 V1

Subject Reference		Biology 3.2			
Title		Integrate biological knowledge to develop an informed response to a socio-scientific issue			
Level	3	Credits	3	Assessment	Internal
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves integrating biological knowledge to develop an informed response to a socio-scientific issue.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Integrate biological knowledge to develop an informed response to a socio-scientific issue. 	<ul style="list-style-type: none"> Integrate biological knowledge to develop a reasoned informed response to a socio-scientific issue. 	<ul style="list-style-type: none"> Integrate biological knowledge to develop a comprehensive informed response to a socio-scientific issue.

Explanatory Notes

1 *Integrate biological knowledge to develop an informed response* involves:

- presenting a personal position, developed using relevant biological knowledge
- proposing action(s) at a personal and/or societal level.

Integrate biological knowledge to develop a reasoned informed response involves:

- explaining why the position and the action(s) have been chosen.

Integrate biological knowledge to develop a comprehensive informed response involves:

- justifying the personal position and proposed action(s) by analysing and evaluating the biological knowledge related to the issue. This may include:
 - comparing the significance of implications
 - considering the likely effectiveness of the proposed action(s)
 - commenting on sources and information, considering ideas such as
 - validity – currency, peer review status, scientific acceptance
 - bias – attitudes, values, beliefs.

2 *Integrate* refers to selecting and collating relevant biological knowledge to develop an informed response.

3 A *socio-scientific issue* has both biological and social implications. The issue is one for which people hold different opinions or viewpoints. Social implications may be economic, ethical, cultural, or environmental.

4 *Biological knowledge* includes:

- biological concepts and processes relating to the issue
- biological and social implications of the issue
- differing opinions or viewpoints about the issue.

Achievement Standard 91603 V1

Subject Reference		Biology 3.3			
Title		Demonstrate understanding of the responses of plants and animals to their external environment			
Level	3	Credits	5	Assessment	External
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves demonstrating understanding of the responses of plants and animals to their external environment.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of the responses of plants and animals to their external environment. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of the responses of plants and animals to their external environment. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of the responses of plants and animals to their external environment.

Explanatory Notes

Life processes, ecology and evolution, 'Understand the relationship between organisms and their environment'.

- 1 *Demonstrate understanding* involves describing plant and animal responses to their external environment. The description includes:
 - the process(es) within each response and/or the adaptive advantage provided for the organism in relation to its ecological niche.

Demonstrate in-depth understanding involves using biological ideas to explain:

- how the responses occur
- why the responses provide an adaptive advantage for the organism in relation to its ecological niche.

Demonstrate comprehensive understanding involves:

- linking biological ideas to explain why the responses provide an adaptive advantage for the organism in relation to its ecological niche. The linking of ideas may involve justifying, relating, evaluating, comparing and contrasting, and analysing.

- *Responses* are selected from those relating to:

- orientation in space (tropisms, nastic responses, taxes, kineses, homing, migration)
- orientation in time (annual, daily, lunar, tidal rhythms)
- interspecific relationships (competition for resources, mutualism, exploitation including herbivory, predation, and parasitism)
- intraspecific relationships (competition for resources, territoriality, hierarchical behaviour, cooperative interactions, reproductive behaviours).

- 2 *External environment* will include both biotic and abiotic factors.

Achievement Standard 91604 V1

Subject Reference		Biology 3.4			
Title		Demonstrate understanding of how an animal maintains a stable internal environment			
Level	3	Credits	3	Assessment	Internal
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves demonstrating understanding of how an animal maintains a stable internal environment.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of how an animal maintains a stable internal environment. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of how an animal maintains a stable internal environment. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of how an animal maintains a stable internal environment.

Explanatory Notes

- Demonstrate understanding* involves using biological ideas to describe a control system by which an animal maintains a stable internal environment. Annotated diagrams or models may be used to support the description.

Demonstrate in-depth understanding involves using biological ideas to explain how or why an animal maintains a stable internal environment. This includes explaining how a specific disruption results in responses within a control system to re-establish a stable internal environment.

Demonstrate comprehensive understanding involves linking biological ideas about maintaining a stable internal environment in an animal. This includes at least one of:

- a discussion of the significance of the control system in terms of its adaptive advantage
 - an explanation of the biochemical and/or biophysical processes underpinning the mechanism (such as equilibrium reactions, changes in membrane permeability, metabolic pathways)
 - an analysis of a specific example of how external and/or internal environmental influences result in a breakdown of the control system.
- A control system that maintains a stable internal environment (homeostatic system) refers to those that regulate:
 - body temperature
 - blood pressure
 - osmotic balance
 - level of blood glucose
 - levels and balance of respiratory gases in tissues.
 - The biological ideas related to the control system includes the:
 - purpose of the system
 - components of the system
 - mechanism of the system (how it responds to the normal range of environmental fluctuations, interaction and feedback mechanisms between parts of the system)
 - potential effect of disruption to the system by internal or external influences.
 - Environmental influences that result in a breakdown of the control system may be external influences such as extreme environment conditions, disease or infection, drugs or toxins, or internal influences such as genetic conditions or metabolic disorders.

Achievement Standard 91605 V1

Subject Reference		Biology 3.5			
Title		Demonstrate understanding of evolutionary processes leading to speciation			
Level	3	Credits	4	Assessment	External
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves demonstrating understanding of evolutionary processes leading to speciation.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> • Demonstrate understanding of evolutionary processes leading to speciation. 	<ul style="list-style-type: none"> • Demonstrate in-depth understanding of evolutionary processes leading to speciation. 	<ul style="list-style-type: none"> • Demonstrate comprehensive understanding of evolutionary processes leading to speciation.

Explanatory Notes.

- Demonstrate understanding* involves using biological ideas and/or scientific evidence to describe evolutionary processes leading to speciation.

Demonstrate in-depth understanding involves using biological ideas and/or scientific evidence to explain how or why evolutionary processes lead to speciation.

Demonstrate comprehensive understanding involves linking biological ideas and/or scientific evidence about evolutionary processes leading to speciation. The linking of ideas may involve justifying, relating, evaluating, comparing and contrasting, or analysing the evolutionary processes that lead to speciation.
- Evolutionary processes* involve the following biological ideas:

 - role of mutation
 - gene flow
 - role of natural selection and genetic drift
 - modes of speciation (sympatric, allopatric)
 - reproductive isolating mechanisms that contribute to speciation (geographical, temporal, ecological, behavioural, structural barriers, polyploidy)
 - patterns such as divergence, convergence, adaptive radiation, co-evolution, punctuated equilibrium, and gradualism.
- Scientific evidence for evolution, which may include examples from New Zealand's flora and fauna, will be selected from:

 - fossil evidence
 - comparative anatomy (homologous and analogous structures)
 - molecular biology (proteins and DNA analysis)
 - biogeography.

Achievement Standard 91606 V1

Subject Reference		Biology 3.6			
Title		Demonstrate understanding of trends in human evolution			
Level	3	Credits	4	Assessment	External
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves demonstrating understanding of trends in human evolution.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of trends in human evolution. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of trends in human evolution. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of trends in human evolution.

Explanatory Notes

- Demonstrate understanding* involves using biological ideas to describe trends in human evolution. *Demonstrate in-depth understanding* involves using biological ideas to explain how or why trends in human evolution occur.

Demonstrate comprehensive understanding involves linking biological ideas about trends in human evolution. The linking of ideas may involve justifying, relating, evaluating, comparing and contrasting, and analysing using scientific evidence.
- Trends in human evolution* refers to change over a period of time in relation to:

 - human biological evolution
 - human cultural evolution
 - patterns of dispersal of hominins. Hominins refers to living and fossil species belonging to the human lineage. This is a subgroup of hominids, a group which includes both humans and the great apes.
- Trends in human biological evolution begin with early bipedal hominins and may require comparison with living hominids. These trends involve:

 - skeletal changes linked to bipedalism
 - changes in skull and endocranial features
 - changes in the manipulative ability of the hand.
- Trends in human cultural evolution involve:

 - use of tools (stone, wood, bone)
 - use of fire
 - clothing
 - abstract thought (communication, language, art)
 - food-gathering (hunter-gatherer, domestication of plants and animals)
 - shelter (caves, temporary settlement, permanent settlement).
- Interpretations of the trends in human evolution are based on current scientific evidence which is widely accepted and presented in peer-reviewed scientific publications.

Achievement Standard 91607 V1

Subject Reference		Biology 3.7			
Title		Demonstrate understanding of human manipulations of genetic transfer and its biological implications			
Level	3	Credits	3	Assessment	Internal
Subfield		Science	Domain		Biology
Status		Registered	Status date		4 December 2012
Planned review date		31 December 2016	Date version published		4 December 2012

This achievement standard involves demonstrating understanding of human manipulations of genetic transfer and its biological implications.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Demonstrate understanding of human manipulations of genetic transfer and its biological implications. 	<ul style="list-style-type: none"> Demonstrate in-depth understanding of human manipulations of genetic transfer and its biological implications. 	<ul style="list-style-type: none"> Demonstrate comprehensive understanding of human manipulations of genetic transfer and its biological implications.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 8 within the Science learning area. It is aligned with the following achievement objectives in the Living World strand Life processes, ecology, and evolution:

- Understand how humans manipulate the transfer of genetic information from one generation to the next and make informed judgements about the social, ethical, and biological implications relating to this manipulation
- Explore the evolutionary processes that have resulted in the diversity of life on Earth and appreciate the place and impact of humans within these processes.

It is also related to the material in the *Teaching and Learning Guide for Biology*, Ministry of Education, 2010, at <http://seniorsecondary.tki.org.nz>.

2 *Demonstrate understanding* involves using biological ideas to describe human manipulations of genetic transfer and its biological implications.

Demonstrate in-depth understanding involves using biological ideas to explain how humans manipulate genetic transfer and the biological implications of these manipulations.

Demonstrate comprehensive understanding involves linking biological ideas about human manipulations of genetic transfer and its biological implications. The linking of ideas may involve justifying, relating, evaluating, comparing and contrasting, and analysing.

3 *Human manipulations of genetic transfer* may involve:

- selective breeding (could include embryo selection, animal breeding, plant breeding, development of new crops)
- whole organism cloning
- transgenesis
- investigation and modification of the expression of existing genes.

4 *Biological implications* may involve the impact on:

- ecosystems
- genetic biodiversity
- health or survival of individuals
- survival of populations
- evolution of populations.