



National Certificate of Educational Achievement  
TAUMATA MĀTAURANGA Ā-MOTU KUA TĀEA

## Internal Assessment Resource

### Biology Level 2

This resource supports assessment against:

Achievement Standard 91155 version 2

Demonstrate understanding of adaptation of plants or animals  
to their way of life

**Resource title: In and out and round about...**

3 credits

This resource:

- Clarifies the requirements of the standard
- Supports good assessment practice
- Should be subjected to the school's usual assessment quality assurance process
- Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic

Date version published by Ministry of Education	July 2017 Version 3 To support internal assessment from 2017
Quality assurance status	These materials have been quality assured by NZQA. NZQA Approved number: A-A-07-2017-91155-03-5832
Authenticity of evidence	Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.  Using this assessment resource without modification may mean that students' work is not authentic. The teacher may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform.

## Internal Assessment Resource

**Achievement Standard Biology 91155:** Demonstrate understanding of adaptation of plants or animals to their way of life

**Resource reference:** Biology 2.3B v3

**Resource title:** In and out and round about...

**Credits:** 3

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### Teacher guidelines

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The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by achievement standard Biology 91155. The achievement criteria and the explanatory notes (EN) contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

### Context/setting

This activity requires students to demonstrate understanding of adaptations across **two life processes within one taxonomic or functional group** of multicellular plants or animals. The two life processes must be connected or related.

Teachers are expected to guide students in their selection of groups and life processes. A Teacher Resource has been provided to assist with this.

Students are required to link the described adaptations to the organism's way of life. Refer to EN 5 for guidance to help clarify what 'way of life' should encompass. It includes:

- relationships with other organisms – competition, predation, parasitism, mutualism
- reproductive strategies
- adaptations to the physical habitat.

Teachers should note however that adaptations only need to be described, explained or discussed in relation to those aspects relevant to the investigated organism's way of life e.g. if students are investigating gas exchange in mammals this may not be directly relevant to their reproductive strategy, although one could argue it provides the organism with oxygen, which helps it to move around and find a mate. Thus evidence statements in the assessment schedule should be modified accordingly.

### Conditions

Evidence for this assessment might include annotated diagrams and/or drawings from dissection or direct observations of organisms.

Students will keep a portfolio in which they will record all information such as drawings, results from investigations, notes from DVDs, class discussions, processed information from internet sites and textbooks; annotated diagrams, formal notes made in class.

Teachers need to decide the format required of the final report and the assessment conditions. For example, it could be written, or presented as a PowerPoint presentation, seminar, DVD or web page.

More information on the Conditions of Assessment related to this achievement standard can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>.

## Resource requirements

- access to relevant textbooks
- internet access
- DVDs.

## Additional information

Students will need to have a base knowledge of:

- relevant taxonomic groups
- adaptations (structural, behavioural, physiological)
- ecological niche, inter- and intra-specific relationships

A range of teaching and learning opportunities should be provided so students can collect information and add it to their portfolios, including:

- practical activities, such as:
  - dissections, for example of lungs, gills, hearts, digestive systems and/or whole animal, e.g. rat, fish, sheep's pluck
  - examination of skulls and teeth of omnivore, herbivore, carnivore
  - examination of microscopic slides, for example of insect mouthparts / gizzard / spiracles / trachea
  - support and movement, e.g. crab, fish, bird, insect
- field studies / observations, e.g. filter feeding in barnacles or mussels; grazing action of snails; movement in snails, earthworms; zoo; wildlife sanctuary
- classroom discussion
- formal classroom teaching
- independent research using primary and/or secondary sources.

### NOTE:

1. The choice of an animal group (taxonomic or functional) can be guided by the type of habitat and ecological niche of named animal examples within the group. Choosing humans and dogs as mammals, for example, may be restrictive since both have many similar adaptations for their life processes.
2. Considering humans as well as whales as a second mammal example, or a broader taxonomic group like vertebrates (for example, choosing a mammal with a fish or bird as the second animal) can give students more opportunity to show their understanding of adaptations that enable each animal to carry out both life processes in order to survive in their habitat.

## Teacher Resource

### ***Life processes***

Select life processes (EN 6) that are connected or related from:

- internal transport
- gas exchange
- transpiration
- nutrition
- excretion
- support and movement
- sensitivity and co-ordination
- reproduction.

### ***Taxonomic groups***

Taxonomic groups could include, but are not limited to:

- Plants: bryophytes – mosses and liverworts; tracheophytes – ferns; gymnosperms – conifers, angiosperms
- Animals: insects, vertebrates, mammals.

### ***Functional groups***

Functional groups could include, but are not limited to:

- Plants:
  - Nutrition: sun adapted, shade adapted, carnivorous, parasitic
  - Transpiration: mesophytes, xerophytes, hydrophytes
- Animals:
  - Nutrition: fluid feeders (parasites), filter feeders, detritus feeders; carnivorous, herbivorous, omnivorous mammals
  - Transport: open circulation, closed circulation – single, partial double, complete double
  - Support and Movement: hydrostatic skeleton, endoskeleton, exoskeleton
  - Sensitivity and Coordination: nerve network system, simple central nervous system, complex central nervous system.

### ***Groups and life processes***

Group(s) and life processes might include:

- gas exchange and transport in mammals
- transpiration and transport in angiosperms
- nutrition and transport in carnivorous plants
- nutrition and gas exchange in ectoparasites
- support and movement and gas exchange in mammals
- nutrition and excretion in insects.

## Internal Assessment Resource

**Achievement Standard Biology 91155:** Demonstrate understanding of adaptation of plants or animals to their way of life

**Resource reference:** Biology 2.3B v3

**Resource title:** In and out and round about...

**Credits:** 3

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of adaptation of plants or animals to their way of life.	Demonstrate in-depth understanding of adaptation of plants or animals to their way of life.	Demonstrate comprehensive understanding of adaptation of plants or animals to their way of life.

### Student instructions

#### Introduction

This assessment activity requires you to work individually to develop a portfolio of information which you can use to produce a written report on the adaptations relating to gas exchange and internal transport in mammals. The portfolio should also include information on how these adaptations allow the mammals to carry out their way of life or occupy the ecological niches that they do.

Teacher note: Substitute different systems and functional or taxonomic groups as per suggestions in the Teacher Guidelines, to suit your context.

This is a resource-based assessment: you are able to access resources gathered in your programme of learning as you write your report.

You will have a time period of 3–4 weeks in and out of class to collect information, develop a portfolio, and present your report.

You will have approximately 2 hours of class time to individually write your report.

Teacher note: Adapt the time frame as necessary and provide your students with deadline dates for gathering material for the portfolio and for producing the final report.

Your portfolio will record all the information you collect on gas exchange and transport such as drawings from observations / examinations / dissections, results from investigations, notes from DVDs, class discussions, processed information from internet sites and textbooks, annotated diagrams, and formal notes made in class. You will use this information to develop your report.

Teacher note: Other formats for the report are possible. For example, it could be presented as a written report, a PowerPoint presentation, a seminar, a DVD presentation, or a web page. If another format is used you will need to ensure the sufficiency of the evidence and provide guidance about the time needed to develop the report.

You will be assessed on the extent to which your report shows your comprehensive understanding of how mammals have adapted to their way of life in relation to the life processes of gas exchange and internal transport.

An organism's *way of life* is determined by how it relates to other organisms in its surrounding environment (e.g. competition, predation, parasitism, mutualism), the reproductive strategies it employs to ensure survival of the species and how it adapts to its physical habitat. Their *adaptations* involve the range of ways in which the organism has developed strategies to carry out their life processes in order to survive and reproduce. An adaptation refers to a feature and its function that provides an advantage for the organism in its specific habitat and ecological niche. It may include structural, behavioural, or physiological features of the organism.

## Task

Complete a written report on the adaptations relating to gas exchange and internal transport in two mammals to show how or why these adaptations allow each to survive in its habitat.

Use your portfolio of collected, relevant biological information to provide supporting evidence. Your written report should:

- Name the two mammals you have studied and provide a brief description of their ecological niches e.g. physical habitat, relationships with other organisms.
- Describe the structural, behavioural and/or physiological adaptations that enable each mammal to carry out gas exchange and internal transport.

Teacher note: Adapt this as necessary to suit any other systems and group that have been substituted.

- Explain how or why these adaptations enable each mammal to successfully carry out gas exchange and internal transport in order to survive in its habitat. You should provide examples to support your explanations.
- Discuss how these adaptations for gas exchange and internal transport are connected in each mammal. Your discussion should include examples linking several biological ideas to show how the adaptations:
  - enhance the effectiveness of both life processes in each mammal
  - have limitations and advantages of named features or processes within each mammal.
- You may use annotated diagrams to support your answer.

Hand your portfolio to your teacher along with your completed report.

## Assessment schedule: Biology 91155 In and out and round about...

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
<p>The student demonstrates understanding of adaptation of animals across two life processes within one taxonomic or functional group to their way of life.</p> <p>The written report will include a named, description of at least <b>two</b> mammals studied.</p> <p>For each life process of gas exchange and internal transport:</p> <ul style="list-style-type: none"> <li>• A description of <b>two</b> adaptations (structural, behavioural or physiological) that help mammals survive.</li> <li>• A description of <b>one</b> adaptation for <b>two</b> mammal examples that allows them to carry out <b>two</b> from:               <ul style="list-style-type: none"> <li>– survival in their physical habitat</li> <li>– a reproductive strategy</li> <li>– a relationship with other organisms e.g. competition, mutualism, parasitism.</li> </ul> </li> </ul> <p>The report may include as evidence, diagrams as appropriate, clearly annotated.</p> <p>For example: <i>Humans are terrestrial mammals as they live on land. Marine mammals like dolphins are diving mammals, living in specialised ecological niches within the ocean.</i> <i>While their adaptations are similar, the differences are related to their habitats being very different.</i> <i>Terrestrial and marine mammals have a double circulation system with a 4-chambered heart which works as a pump to transport the blood and the</i></p>	<p>The student demonstrates in-depth understanding of adaptation of animals across two life processes within one taxonomic or functional group to their way of life.</p> <p>The written report will include a named, description of at least <b>two</b> mammals studied.</p> <p>For each life process of gas exchange and internal transport:</p> <ul style="list-style-type: none"> <li>• A description of two or more relevant adaptations (structural, behavioural or physiological) that help mammals survive.</li> <li>• A description of <b>one</b> adaptation for <b>two</b> mammal examples that allows them to carry out <b>two</b> from:               <ul style="list-style-type: none"> <li>– survival in their physical habitat</li> <li>– a reproductive strategy</li> <li>– a relationship with other organisms e.g. competition, mutualism, parasitism.</li> </ul> </li> <li>• An explanation of how or why one adaptation (structural, behavioural or physiological) for two mammal examples for one life process enables them to live successfully in their way of life.</li> </ul> <p>The report may include as evidence, diagrams as appropriate, clearly annotated.</p> <p>For example: <i>Terrestrial and marine mammals have an efficient double circulation system which allows for a high rate of metabolism, even though they have different habitats.</i> <i>In both mammal groups, moist membranes in the</i></p>	<p>The student demonstrates comprehensive understanding of adaptation of animals across two life processes within one taxonomic or functional group to their way of life.</p> <p>The written report will include a named, description of at least <b>two</b> mammals studied.</p> <p>For each life process of gas exchange and internal transport:</p> <ul style="list-style-type: none"> <li>• A description of two or more relevant adaptations (structural, behavioural or physiological) that help mammals survive.</li> <li>• A description of <b>one</b> adaptation for <b>two</b> mammal examples that allows them to carry out <b>two</b> from:               <ul style="list-style-type: none"> <li>– survival in their physical habitat</li> <li>– a reproductive strategy</li> <li>– a relationship with other organisms e.g. competition, mutualism, parasitism.</li> </ul> </li> <li>• An explanation of how or why one adaptation (structural, behavioural or physiological) for two mammal examples for one life process enables them to live successfully in their way of life.</li> <li>• Linking several biological ideas to compare gas exchange and internal transport in mammals to include:               <ul style="list-style-type: none"> <li>– how the two related life processes are connected within each mammal so that they enhance their effectiveness</li> <li>– the limitations and advantages of named features or aspects of the life processes.</li> </ul> </li> </ul>

<p><i>substances it is carrying throughout the body. The lungs in both groups are the gas exchange organs. As well as haemoglobin, marine mammal's blood contains myoglobin, a protein that binds the oxygen in the muscles. This helps them when diving. Terrestrial mammals only have haemoglobin to transport oxygen.</i></p> <p><i>Terrestrial and marine mammals have grape-like shaped alveoli. These are the tiny, hollow thin membrane air sacs covered with blood capillaries that provide the gas exchange surfaces.</i></p> <p><i>Oxygen is needed by both mammal groups for cellular respiration. This releases energy for both to carry out all life processes like growth, movement and reproduction.</i></p> <p><i>The examples above are indicative samples only.</i></p>	<p><i>alveoli allow diffusion, which can only happen when the gases are dissolved.</i></p> <p><i>Blood capillaries wrap around each alveolus in the lungs. Both the capillaries and alveoli are bound in thin, moist membranes to facilitate rapid diffusion of the gases between blood and lungs.</i></p> <p><i>The large numbers of hollow alveoli and capillaries around each alveolus greatly increase the surface area so that gas exchange is maximised.</i></p> <p><i>When marine mammals are at a depth they can compress their lungs which helps prevent nitrogen from entering their blood.</i></p> <p><i>Terrestrial mammals do not use myoglobin as much as dolphins. They use haemoglobin, because they do not need to hold their breath for any reason. Internal transport would not be able to occur without proteins like haemoglobin and myoglobin.</i></p> <p><i>Marine mammals can slow their heart rate and redistribute their blood supply to only critical organs which enable them to dive for longer periods of time and hunt for food.</i></p> <p><i>The examples above are indicative samples only.</i></p>	<p>For example:</p> <p><i>Marine mammals' blood contains haemoglobin as well as myoglobin. This allows them to minimise their use of oxygen without negatively affecting their muscle usage.</i></p> <p><i>Marine mammals need to be able to stay under water for long periods of time. As oxygen in their blood starts to run out, they can use oxygen stored in their muscle tissue. Most land mammals like humans do not put myoglobin to much use as in their habitat they have a constant supply of air to breathe.</i></p> <p><i>A key difference is that marine mammals exhale then dive in order to dive deep and long, whereas terrestrial mammals inhale and exhale air while breathing on land.</i></p> <p><i>An advantage for terrestrial mammals is that they are exposed to air all the time and can find food without having to come up to the surface to breathe like marine mammals..</i></p> <p><i>An advantage for marine mammals is their myoglobin, storing oxygen so that they can dive deep and long.</i></p> <p><i>Pumping by the heart in both mammals ensures rapid circulation of blood, maintaining a high concentration gradient for both gases between the capillaries and alveoli. This maximises gas exchange as oxygen is rapidly removed from the alveoli and carbon dioxide is rapidly removed from the blood.</i></p> <p><i>The examples above are indicative samples only.</i></p>
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Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the achievement standard.