NCEA Review and Maintenance Programme – 2026 updates

Review and maintenance work has been undertaken for all three levels of NZC NCEA for 2026. This pdf document contains the updated assessment materials for **Biology Level 3**. In January 2026 the NCEA website will be updated with these changes for Level 1, and the pdf version will be removed as it will no longer be necessary. For Levels 2 and 3, assessment materials will be updated on TKI in January. For external assessment specifications, refer to the NZQA website.

Subject: Biology
Level 3

Product	What's changed?
AS3.4c 91604 Internal Assessment Activity	New Internal Assessment Activity provided in the context of the human blood glucose homeostatic system

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Internal Assessment Resource
Biology Level 3

This resource supports assessment against:

Achievement Standard 91604

Demonstrate understanding of how an animal maintains a stable internal environment

Resource title: How Sweet

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	October 2025 To support internal assessment from 2026
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.

Te Poutāhū Curriculum Centre
Te Tāhuhu o te Mātauranga Ministry of Education

Internal Assessment Resource

Achievement Standard Biology 91604: Demonstrate understanding of how an animal maintains a stable internal environment

Resource reference: Biology 3.4C

Resource title: How Sweet

Credits: 3

Teacher guidelines

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 91604. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

Context/setting

The task involves students demonstrating an understanding of a homeostatic control system and how it functions to maintain a stable internal environment despite external influences. This includes the biological ideas related to the purpose, components, and mechanisms of the blood glucose control system in a human being. It also includes describing the potential effect of disruption to the system by internal or external influences.

Students are asked to explain the biological ideas related to the purpose, components, and mechanisms of the human blood glucose control system. This involves describing how the system incorporates components and explaining how the system responds to a range of influences. Students are also asked to explain how a specific disruption results in responses within the control system to re-establish a stable internal environment.

To demonstrate comprehensive understanding, they must link biological ideas about maintaining a stable blood glucose level, including a discussion of the adaptive significance of the control system, OR a discussion of the biochemical and/or biophysical processes underpinning the mechanism, OR an analysis of a specific example of a breakdown of the control system.

Other possible contexts include:

- osmoregulation in a euryhaline New Zealand fish species
- thermoregulatory control in an athlete competing in an endurance race
- respiratory gas levels in tissues of a marathon runner during the run
- manipulation of reproductive cycles in dairy cows to enhance milk production.

Before modifying this resource in another context the teacher should select/finalise/negotiate a context that will engage their students, plan exactly how the assessment is applied to this context, create or finalise any student pages that are needed (e.g. possible negative feedback models), and ensure that the examples of evidence in the assessment schedule align with the task in its final form.

Conditions

It is suggested that assessment takes place over approximately 4 hours; this allows for up to 30 minutes of group discussion and at least 3 hours of individual work.

Facilitate a preliminary group discussion of the scenario resource(s) to identify aspects relevant to control systems in humans. Students may take notes during the discussion, but you should not have direct input at any stage.

Students work independently to produce their final report using only the provided resources. Resources used should be processed into the students' own words and should be included with the report as evidence of processing.

The final report could include evidence in written, visual, or electronic form or a constructed model. The diagram or model could be produced using an appropriate computer program/software.

Assessors must monitor the process of evidence collection to ensure authenticity, for example by regularly discussing student evidence or using checkpoints or milestones.

Resource requirements

Stimulus material in the scenario could include daily diet and exercise plans. These must be used **in support of** demonstrating an understanding of a homeostatic control system.

Access to computers may be required.

Additional information

Prior learning should incorporate the indicators from *The New Zealand Curriculum* Level 8 Science Living World achievement objective on Life Processes, Ecology and Evolution: 'Understand the relationship between organisms and their environment', related to the material in the Teaching and Learning Guide for Biology, Ministry of Education, at TKI - Biology.

Internal Assessment Resource

Achievement Standard Biology 91604: Demonstrate understanding of how an animal maintains a stable internal environment

Resource reference: Biology 3.4C

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Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of how an animal maintains a stable internal environment.	Demonstrate in-depth understanding of how an animal maintains a stable internal environment.	Demonstrate comprehensive understanding of how an animal maintains a stable internal environment.

Student instructions

Introduction

This assessment activity requires you to write a report that describes human blood glucose homeostasis, and how this works to enable a person to maintain a stable internal environment when external influences occur. This will involve describing the purpose, components, and mechanisms of the system and explaining how they work together. Although the external influences will be part of your description, the focus of this assessment is on the internal biological processes of homeostasis.

You will be assessed on the comprehensiveness of your report and the extent to which you link biological ideas about maintaining a stable internal environment in an animal.

Your teacher will facilitate a preliminary group discussion to identify aspects relevant to your task. It would be useful to make notes during the discussion time.

> Teacher note: Select a time frame that suits you and your students, ensuring they have enough time to complete the assessment. Specify milestone points to monitor progress and a due date.

Work independently to produce the report using only the resources provided. No additional resource material or references should be brought into writing sessions, although you may carry out additional research to enhance your understanding of blood glucose control systems in humans between report-writing sessions.

Your report could include evidence in written, visual, or electronic form, or a constructed model. For example, a diagram or model could be produced using an appropriate computer program/software.

You have 4 hours to analyse the scenario given in the task below and to produce your report.

Task

How sweet

Negative feedback mechanisms in the human body regulate blood glucose levels. Throughout each day there are many factors that act as disruptions to our usual set point of 5mM for blood glucose.

The homeostasis of our blood glucose level is disrupted by normal activities such as:

- eating a meal
- going for a run.

To gain homeostasis — stability in the blood glucose level — takes a lot of actions from components in the negative feedback mechanism. When there is a breakdown in a mechanism of the system the consequence can be diabetes.

You need to write a report discussing how our blood glucose negative feedback mechanism is affected by running and then eating bao buns.

Include in your discussion:

detail around the purpose/s of maintaining blood glucose levels throughout the day and throughout your adult years

an outline of the roles of the named components of this homeostatic control system, which may include an annotated diagram or model

an explanation of the internal biochemical pathway/s and feedback mechanisms occurring

- when someone runs
- when they eat bao buns and
- when they fall asleep for 8 hours.

In your report, link biological ideas about maintaining a stable internal environment for any one of the following:

a discussion of the adaptive significance of this control system

a discussion of the biochemical and/or biophysical processes underpinning the mechanism of this control system (e.g. equilibrium reactions, changes in membrane permeability, metabolic pathways)

an analysis of a specific example of how a breakdown of this control system results in unwanted, dangerous consequences.

Assessment schedule: Biology 91604 How sweet

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
The student demonstrates understanding using biological ideas to **describe** a control system by which a human in the scenario maintains a stable internal environment, including the: • purpose • components • mechanisms • potential effect of disruption of the blood glucose homeostatic control system. *Annotated diagrams or models may be used to support the description.* The student demonstrates understanding of the internal control systems for maintaining stable internal body temperature **in response to a normal range** of environmental fluctuations. *For example:* *Human blood glucose concentration needs to be maintained at about 5mM. Maintaining this at a stable level ensures a consistent energy supply to organs and tissues and optimal brain function including concentration, memory and mood.* *Glucose is the body's primary and preferred energy source for all cells, but particularly for the brain and muscles. Blood glucose concentration refers to the amount of glucose dissolved in the bloodstream at any given time. It is necessary to control the concentration because the body's supply of glucose comes from food, so it will increase during digestion, and it will decrease in response to energy demands.*	The student demonstrates in-depth understanding using biological ideas to **explain how** a human in the scenario maintains a stable internal environment by including the: • purpose • components • mechanisms • potential effect of disruption of the thermoregulatory homeostatic control system. *Annotated diagrams or models may be used to support the explanation.* The student also uses the scenario to demonstrate how balance is re-established **following one specific disruption** to this homeostatic system. *For example:* *This is what happens when someone eats bao buns (or any high-carb meal):* *The digestive system turns the carbohydrates in bao buns into glucose like this:* *The enzyme amylase in saliva starts breaking the carbohydrates down into simpler sugars like maltose (a disaccharide made of two glucose molecules). At the same time the pancreas releases pancreatic amylase which continues breaking down starches into maltose and other disaccharides. Enzymes in the intestinal lining (like maltase, sucrase and lactase) break these disaccharides down further, primarily into glucose.*	The student demonstrates comprehensive understanding of **how** a human in the scenario maintains a stable internal environment by **linking** biological ideas of the: • purpose • components • mechanisms • potential effect of disruption of the thermoregulatory homeostatic control system. *Annotated diagrams or models may be used to support the linked discussion.* The student's response also includes at least **one of**: a discussion of the **adaptive significance** of the control system a discussion 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 such as extreme environmental conditions, disease or infection, drugs or toxins, genetic conditions, or metabolic disorders. *For example:* *In a healthy system, insulin binds to insulin receptors on the surface of cells. A signalling cascade prompts*

This natural fluctuation needs to be brought back to a concentration of 5mM to enable efficient cellular functions. When blood glucose concentration falls outside the range of 4mM-6mM, the body will experience physiological stress and its glucose-regulating mechanisms can be damaged. For this reason, it is important for the body to control the concentration of glucose in the blood. It monitors the concentration of blood glucose using components in a negative feedback system. *The key components of the human blood glucose homeostatic control system include blood glucose (sugar present in the bloodstream, used by cells for respiration), the pancreas (which monitors blood glucose levels and releases the hormones insulin and glucagon to adjust them), liver and muscles (these store glucose as glycogen and release it when needed). Within the pancreas, the Islets of Langerhans control the endocrine functions of the negative feedback loop. The beta cells detect high blood glucose levels and release insulin into the bloodstream. Insulin helps cells absorb glucose and signals the liver to store glucose as glycogen. Alpha cells detect low blood glucose levels and release glucagon into the bloodstream. Glucagon signals the liver to break down glycogen and release glucose into the bloodstream. When glucose levels return to the normal range of 5mM, the hormone release slows down or stops. Maintaining blood glucose at this level is important for efficient insulin regulation (allowing cells to absorb glucose) and stable hormone responses to maintain homeostasis.* ***[student also includes a description of how the blood glucose homeostatic system responds to the normal range of fluctuations]***	*This glucose is absorbed into the bloodstream through the epithelial cells which line the small intestine, transported by the protein SGLT1 (Sodium-Glucose Transporter 1). This raises the level of blood glucose. The pancreas detects the rising blood glucose and directs the beta cells to release insulin. Insulin binds to insulin receptors on the surface of target cells. These receptors are proteins embedded in the cell membrane. Binding activates a signalling cascade inside the cell – a series of proteins pass the signal inward. This signals the movement of glucose transporter proteins (GLUT4 transporters) to the cell membrane. These transporters allow glucose to enter the cell where it can be:* • *used for energy (cellular respiration)* • *stored as glycogen (in liver and muscle cells)* • *converted into fat (stored in adipose tissue).* *Transporting glucose from the bloodstream into the cell means that the concentration of glucose in the bloodstream will drop. As glucose levels drop, GLUT4 transporters return to their resting position inside the cell and the pancreas stops releasing insulin.* ***[student also includes an explanation of the purpose of the blood glucose homeostatic system and how it responds to the normal range of environmental fluctuations, interactions and feedback mechanisms between parts of the system]*** ***The examples above relate to only part of what is required, and are just indicative.***	*GLUT4 transporters to move to the cell membrane and allow glucose to enter the cell.* *The body's ability to respond to elevated blood sugar levels are multifactorial and include both lifestyle and genetic factors. Excess fat can disrupt insulin signalling, a sedentary lifestyle reduces the ability of muscles to absorb glucose effectively, and an unhealthy diet high in sugars and saturated fats will cause regular spikes in blood sugar and insulin, which can lead to cellular desensitisation. This can change the way the body's cells respond to insulin. When a system has developed insulin resistance (a breakdown of the control system), this signalling pathway goes wrong in numerous ways. Receptor dysfunction is one example. This happens when the insulin receptors become less sensitive, or fewer in number, so that insulin binds less effectively. The signalling cascade can be blocked by proteins like IRS-1 phosphorylating incorrectly due to things like inflammation, excess fatty acids or oxidative stress. This creates a feedback loop which worsens insulin resistance – since cells don't take in glucose efficiently, blood glucose levels remain high. This signals the pancreas to release more insulin, leading to hyperinsulinemia (excessively high levels of insulin in the blood). If this is not treated or reversed, it can lead to Type 2 diabetes. One way in which this can happen is when beta cell exhaustion (chronic overproduction of insulin causing cellular stress and apoptosis) leads to reduced insulin secretion (by the time of diagnosis, 40–50% of beta cell function may be lost).* ***[student response also includes discussion linking the components, mechanisms, and purpose of blood glucose homeostasis, and how the body may be affected by a disruption]***

The examples above relate to only part of what is required and are just indicative.		***The examples above relate to only part of what is required, and are just indicative.***

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.