




Adaptations

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Assessment description	Category
Students research structural and behavioural adaptations and explain how they enable animals to survive in particular environments. They predict the impact of global warming on the survival and future adaptations of animals living in either Antarctica or the Sahara Desert.	Written
	Technique
	Research
Context for assessment	Alignment
Human beings are unique in that they engineer environments to suit the ongoing survival of the species. Other organisms are forced to adapt. This assessment explores different kinds of adaptations, how these adaptations assist organisms to survive in their environment, and the interactions occurring within environments.	<i>Australian Curriculum</i> v5.0, Year 5 Science Australian Curriculum content and achievement standard ACARA — Australian Curriculum, Assessment and Reporting Authority www.australiancurriculum.edu.au
Teachers could use Section 1 as a scaffolded teaching and learning experience and an opportunity to provide students with informal feedback before they engage in research to complete Sections 2 and 3 more independently.	Year 5 Science standard elaborations www.qsa.qld.edu.au/downloads/p_10/ac_sci_yr5_se.doc
	Connections
	This assessment can be used with the QSA Australian Curriculum resource titled <i>Year 5 plan — Australian Curriculum: Science exemplar</i> available at: www.qsa.qld.edu.au/downloads/p_10/ac_science_yr5_plan.doc
	Definitions
	Adaptation: structural features and behaviours that help plants and animals to survive in the environment that they live in. Environment: the surroundings, both living and non-living, that an animal or plant lives in. Organism: an individual animal, plant (or single-celled life form).
In this assessment	Assessment materials
<ul style="list-style-type: none"> • Teacher guidelines • Student booklet • Task-specific standards — continua • Task-specific standards — matrix • Assessment resource — Current scientific conceptions and student’s prior understandings 	Not applicable for this assessment

Teacher guidelines

Identify curriculum

Content descriptions to be taught		
Science understanding	Science as a human endeavour	Science inquiry skills
<p>Biological sciences</p> <ul style="list-style-type: none"> Living things have structural features and adaptations that help them to survive in their environment <p>ACSSU043</p>	<p>Nature and development of science</p> <ul style="list-style-type: none"> Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena <p>ACSHE081</p>	<p>Communicating</p> <ul style="list-style-type: none"> Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts <p>AC SIS093</p>
<p>General capabilities (GCs) and cross-curriculum priorities (CCPs)</p> <p>This assessment may provide opportunities to engage with the following GCs and CCPs. Refer also to the Resources tab on the P–10 Science Curriculum and Assessment page: www.qsa.qld.edu.au/yr5-science-resources.html</p>		
<p> Literacy</p> <p> ICT capability</p> <p> Critical and creative thinking</p>		
<p>Achievement standard</p> <p>This assessment provides opportunities for students to demonstrate the following highlighted aspects.</p> <p>By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives and how science knowledge develops from many people's contributions.</p> <p>Students follow instructions to pose questions for investigation, predict what might happen when variables are changed, and plan investigation methods. They use equipment in ways that are safe and improve the accuracy of their observations. Students construct tables and graphs to organise data and identify patterns. They use patterns in their data to suggest explanations and refer to data when they report findings. They describe ways to improve the fairness of their methods and communicate their ideas, methods and findings using a range of text types.</p>		
<p>Source: ACARA, The Australian Curriculum v5.0, www.australiancurriculum.edu.au</p>		

Sequence learning

Suggested learning experiences

This assessment leads on from the learning experiences outlined in the QSA's Year 5 Science Year level plan. The knowledge, understanding and skills in the Year level plan will prepare students to engage in this assessment:

- See *Year 5 plan — Australian Curriculum: Science exemplar*
www.qsa.qld.edu.au/downloads/p_10/ac_science_yr5_plan.doc

Adjustments for needs of learners

To make adjustments, teachers refer to learning area content aligned to the student's chronological age, personalise learning by emphasising alternate levels of content, general capabilities or cross-curriculum priorities related to the chronological age learning area content. The emphasis placed on each area is informed by the student's current level of learning and their strengths, goals and interests. Advice on the process of curriculum adjustment for all students and in particular for those with disability, gifted and talented or for whom English is an additional language or dialect are addressed in *Australian Curriculum — Student Diversity* materials.

For information to support students with diverse learning needs, see:

- Queensland Studies Authority materials for supporting students with diverse learning needs
www.qsa.qld.edu.au/10188.html
- Australian Curriculum Student Diversity
www.australiancurriculum.edu.au/StudentDiversity/Overview
- The *Melbourne Declaration on Educational Goals for Young Australians*
www.mceecdya.edu.au/mceecdya/melbourne_declaration,25979.html
- The *Disability Standards for Education* www.ag.gov.au.

Resources

Online

- BBC, *Nature: Wildlife*, 'Animal and plant adaptations and behaviours'
www.bbc.co.uk/nature/adaptations

Organisations

- Queensland Museum learning resources
www.qm.qld.gov.au/Learning+Resources/Resources

Animal ethics

- Queensland Department of Education, Training and Employment
<http://education.qld.gov.au/curriculum/area/science/animal-ethics.html>

All schools must consider the 3 Rs of animal welfare:

- *replacement* of animals with other methods (alternatives)
- *reduction* in numbers of animals used
- *refinement* of techniques used, in order to reduce adverse impacts on animals.

These principles must be applied to all activities and should drive decision making in the classroom and within the school.

Develop assessment

Preparing for the assessment

Learning experiences in preparation for the assessment could include:

Revising key concepts

- Revise from Year 3 that living things can be grouped on the basis of observable features (and can be distinguished from non-living things).
- Revise from Year 4 that living things (including plants and animals) depend on each other and the environment to survive.

Exploring adaptations

- Create a glossary or word wall of scientific language related to adaptations
- Use stimulus material such as photos or video footage to identify and classify adaptations as structural or behavioural.
- Use animal and plant specimens to:
 - identify structural adaptations
 - describe structural adaptation
 - explain why the adaptation is necessary in order for the animal or plant to survive in its environment.
- Identify the adaptations of plants and animals in the students' local area and explain how they assist in the survival of the organisms.
- Make predictions about how global warming might affect the survival and future adaptations of the living things in the local area.
- Appreciate Aboriginal and Torres Strait Islander understandings of adaptations.

Developing research skills

- Record details of sources of information used when researching.
- Develop research and summarising skills.
- Practice organising information in logical ways.
- Develop explanations and draw conclusions and use evidence to support claims.

Implementing

Section 1. Researching animal adaptations

Student role

- Read the instructions for Section 1 in the Student booklet.
- Select one of the animals to research — echidna, platypus or camel.
- Conduct research into the environment of the animal and its structural and behavioural adaptations.
- As you research keep a record of the details of the sources of information you use.
- Complete the table in Section 1 of the Student booklet: *Researching animal adaptations*.

Teacher role

- Revise the definitions of structural adaptations, behavioural adaptations and environment with students.
- Remind students of the importance of collecting source details and completing the associated table as they are researching.
- Provide opportunities for students to access online and print resources to research animal adaptations.
- Support students with their research and nominate a checkpoint stage where students discuss the progress towards the assessment.

Section 2. Researching adaptations of animals that live in extreme environments	
<p>Student role</p> <ul style="list-style-type: none"> • Read the instructions for Section 2 in the Student booklet. • Select one of the extreme environments to research – Antarctica, Sahara Desert. • Conduct research into the adaptations of the animals that live in the chosen environment. • As you research keep a record of the details of the sources of information you use. • Complete the table in Section 2 of the Student booklet: <i>Researching adaptations of animals that live in extreme environments</i>. 	<p>Teacher role</p> <ul style="list-style-type: none"> • Remind students of the importance of collecting source details and completing the associated table as they are researching. • Provide opportunities for students to access online and print resources to research animal adaptations. • Support students with their research and nominate a checkpoint stage where students discuss the progress towards the assessment.
Section 3. Analysing adaptations	
<p>Student role</p> <ul style="list-style-type: none"> • Read the instructions for Section 3 in the Student booklet. • Complete the questions in Section 3 of the Student booklet: <i>Analysing adaptations</i>. 	<p>Teacher role</p> <ul style="list-style-type: none"> • When the research phase is complete, discuss strategies with students for identifying patterns and similarities in information. • Read the questions in Section 3 to students and encourage them to consider the 'bigger picture' when developing their response.

Make judgments

When making judgments about the evidence in student responses to this assessment, teachers are advised to use the task-specific standards provided. The development of these task-specific standards has been informed by the Queensland Year 5 standard elaborations. See www.qsa.qld.edu.au/downloads/p_10/ac_sci_yr5_se.doc.

The Queensland standard elaborations for Science

The Queensland Year 5 standard elaborations for Science is a resource to assist teachers to make consistent and comparable evidence-based A to E (or equivalent) judgments. It should be used in conjunction with the Australian Curriculum achievement standard and content descriptions for the relevant year level.

The Queensland Science standard elaborations provide a basis for judging *how well* students have demonstrated what they know, understand and can do using the Australian Curriculum achievement standard.

The Australian Curriculum achievement standards dimensions of Understanding and Skills are used to organise the Queensland Science standard elaborations. Understanding and Skills in Science are organised as Understanding dimension and Skills dimension.

The valued features of Science drawn from the achievement standard and the content descriptions for Understanding dimension and Skills dimension are organised as:

- Science understanding
- Science as a human endeavour
- Questioning and predicting
- Planning and conducting
- Processing and analysing data and information

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- Evaluating
- Communicating.

Task-specific standards

Task-specific standards give teachers:

- a tool for directly matching the evidence of learning in the student response to the standards
- a focal point for discussing student responses
- a tool to help provide feedback to students.

Task-specific standards are not a checklist; rather they are a guide that:

- highlights the valued features that are being targeted in the assessment and the qualities that will inform the overall judgment
- specifies particular *targeted aspects* of the curriculum content and achievement standard
- aligns the valued feature, task-specific descriptor and assessment
- allows teachers to make consistent and comparable on-balance judgments about student work by matching the qualities of student responses with the descriptors
- clarifies the curriculum expectations for learning at each of the five grades (A–E or the early years equivalent)
- shows the connections between what students are expected to know and do, and how their responses will be judged and the qualities that will inform the overall judgment
- supports evidence-based discussions to help students gain a better understanding of how they can critique their own responses and achievements, and identify the qualities needed to improve
- encourages and provides the basis for conversations among teachers, students and parents/carers about the quality of student work and curriculum expectations and related standards.

Task-specific valued features

Task-specific valued features are the discrete aspects of the valued features of Science targeted in a particular assessment and incorporated into the task-specific standards for that assessment. They are selected from the Queensland Science standard elaborations valued features drawn from the Australian Curriculum achievement standard and content descriptions.

Task-specific valued features for this assessment		
The following identifies the valued features for this assessment and makes explicit the understandings and skills that students will have the opportunity to demonstrate. This ensures that the alignment between what is taught, what is assessed and what is reported is clear.		
Australian Curriculum achievement standard dimensions	Queensland standard elaborations valued features	Task-specific valued features
Understanding dimension	Science understanding	Analysis of how the form of living things enables them to function in their environments Sections 1, 2
	Science understanding	Analysis of adaptations that are common to animals living in the same extreme environment; prediction of the impact of global warming on future adaptations Section 3
Skills dimension	Communicating	Communication of ideas, information and explanations Sections 1, 2 and 3

The task-specific standards for this assessment are provided in two models using the same task-specific valued features:

- a matrix
- a continua.

Matrix and continua

Task-specific standards can be prepared as a matrix or continua. Both the continua and the matrix:

- use the Queensland standard elaborations to develop task-specific descriptors to convey expected qualities in student work — A to E or equivalent
- highlight the same valued features from the Queensland standard elaborations that are being targeted in the assessment and the qualities that will inform the overall judgment
- incorporate the same task-specific valued features, i.e. make explicit the particular understanding or skills students have the opportunity to demonstrate for each selected valued feature
- provide a tool for directly matching the evidence of learning in the student response to the standards to make an on-balance judgment about student achievement

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- assist teachers to make consistent and comparable evidence-based A to E or equivalent judgments.

Continua

The continua model of task-specific standards uses the dimensions of the Australian Curriculum achievement standard to organise task-specific valued features and standards as a number of reference points represented progressively along an A–E continuum. The task-specific valued features at each point are described holistically. The task-specific descriptors of the standard use the relevant degrees of quality described in the Queensland standard elaborations.

Teachers determine a position along each continuum that best matches the evidence in the students' responses to make an on-balance judgment about student achievement on the task.

The continua model is a tool for making an overall on-balance judgment about the assessment and for providing feedback on task specific valued features.

Matrix

The matrix model of task-specific standards uses the structure of the Queensland standard elaborations to organise the task-specific valued features and standards A to E. The task-specific descriptors of the standard described in the matrix model use the same degrees of quality described in the Queensland standard elaborations.

Teachers make a judgment about the task-specific descriptor in the A to E (or equivalent) cell of the matrix that best matches the evidence in the students' responses in order to make an on-balance judgment about how well the pattern of evidence meets the standard.

The matrix is a tool for making both overall on-balance judgments and analytic judgments about the assessment. Achievement in each valued feature of the Queensland standard elaboration targeted in the assessment can be recorded and feedback can be provided on the task-specific valued features.

Use feedback

Feedback to students	<p>Evaluate the information gathered from the assessment to inform teaching and learning strategies. Focus feedback on the student's personal progress and the next steps in the learning journey.</p> <p>The task-specific standards for this assessment can be used as a basis for providing feedback to students.</p> <p>Offer feedback that:</p> <ul style="list-style-type: none">• maximises students' opportunities to succeed in the assessment by providing feedback on:<ul style="list-style-type: none">– conducting effective, focused research– developing explanations (rather than descriptions)– identifying patterns and similarities across information collected during research– making evidence-based predictions• involves students in the process by providing opportunities to ask follow-up questions• focuses on each student's personal progress relative to previous achievements• identifies the characteristics of a high-quality response that aligns with the descriptors in the task-specific standards.
Resources	<p>For guidance on providing feedback, see the professional development packages titled:</p> <ul style="list-style-type: none">• <i>About feedback</i> www.qsa.qld.edu.au/downloads/p_10/as_feedback_about.doc• <i>Seeking and providing feedback</i> www.qsa.qld.edu.au/downloads/p_10/as_feedback_provide.doc

Adaptations

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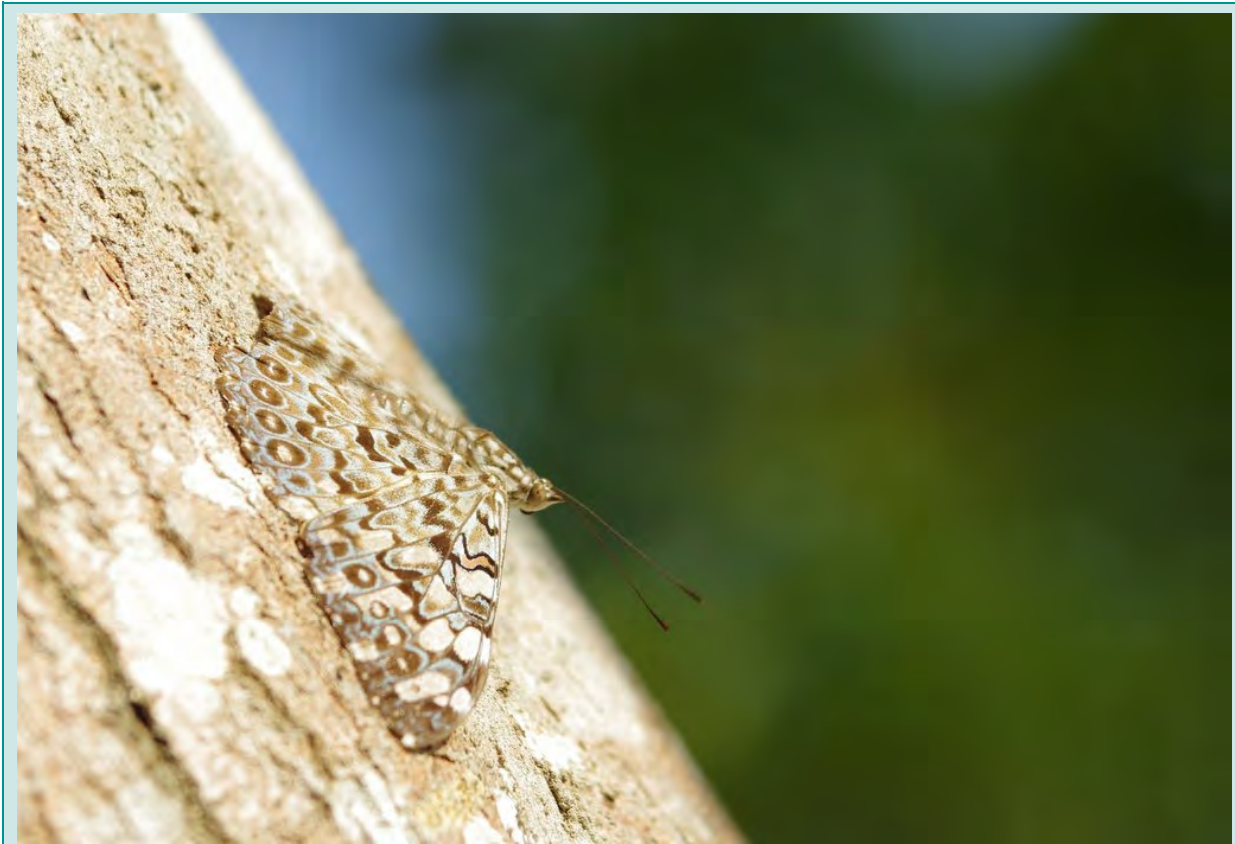


Image: *Camouflage*, guilherme jofili, Creative Commons Attribution 2.0, www.flickr.com/photos/gjofili/6490129117

Research structural and behavioural adaptations that assist animals to survive in their environment and use this information to develop explanations and predictions.

You will:

- research the environment and structural and behavioural adaptations of an Australian animal to explain how these adaptations help the animal to survive in its environment.
- research structural and/or behavioural adaptations of animals that live in an extreme environment and identify structural features and/or behaviours that are common across the animals.
- predict how global warming might affect the survival and future adaptations of animals.

Section 1. Researching animal adaptations

Adaptations are features and behaviours that help plants and animals to survive in the environment that they live in.

A living thing's adaptations are most effective in its own environment. If its environment changes, these adaptations may no longer be effective and the living thing may have difficulty meeting its needs.

Structural adaptations are the physical features that help organisms to survive.

Behavioural adaptations are the things organisms do in order to survive.

An **environment** is the surroundings, both living and non-living, that an animal or plant lives in.

What you need to do

- Select **one** of the following animals.
- Research the environment the animal lives in and its structural and behavioural adaptations.
- Record the information in the table on the next page and **explain** how these adaptations help the animal to survive in its environment.

Echidna	Platypus	Camel
		
<p>Image: <i>echidna</i>, Frankzed, Creative Commons Attribution 2.0, www.flickr.com/photos/frankzed/6387790241</p>	<p>Image: <i>Feeding Platypus</i>, Brisbane City Council, Creative Commons Attribution 2.0, www.flickr.com/photos/brisbanecitycouncil/6811147158</p>	<p>Image: <i>It's Camel</i>, Tarek Siala, Creative Commons Attribution 2.0, www.flickr.com/photos/tarksiala/10591251906</p>

My research

The animal I have chosen is:

The type of environment it lives in is:

The **structural** adaptations of this animal include:

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Explain how these physical features help the animal to survive in its environment:

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The **behavioural** adaptations of this animal include:

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Explain how these behaviours help the animal to survive in its environment:

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Whenever you conduct research it is important to acknowledge where you got your information from. Complete the details below for each source of information that you used to complete the table above.

Source 1:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published:Page no/s:

Source 2:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published:Page no/s:

Source 3:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published:Page no/s:

Source 4:

Internet site Book Magazine Other:



Site name and URL:

Author, title and publisher:

Date accessed or published:Page no/s:

Section 2. Researching adaptations of animals that live in extreme environments

- Select **one** of the following environments.
- Identify three animals that live in your chosen environment.
- Research up to three structural and/or behavioural adaptations of each animal and **explain** how these physical features and behaviours help the animal to survive in its environment.
- Record the information in the table below.

<p>Antarctica</p>  <p><small>Image: <i>Antarctica Sailing Trip</i>, 23am.com, Creative Commons Attribution 2.0, www.flickr.com/photos/23am/3254471852</small></p>	<p>The Sahara Desert, Africa</p>  <p><small>Image: <i>Sahara Desert</i>, wonker, Creative Commons Attribution 2.0, www.flickr.com/photos/wonker/4301197324</small></p>
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My research		
<p>The environment I have chosen is:</p>		
<p>The features of this environment are:</p>		
Animal	Structural or behavioural adaptations	Explain how does this structural feature or behaviour help the animal to survive in this environment?

Whenever you conduct research it is important to acknowledge where you got your information from. Complete the details below for each source of information that you used to complete the table above.

Source 1:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published: Page no/s:

Source 2:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published: Page no/s:

Source 3:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published: Page no/s:

Source 4:

Internet site Book Magazine Other:

Site name and URL:

Author, title and publisher:

Date accessed or published: Page no/s:

Section 3. Analysing adaptations

Look at the list of structural and behavioural adaptations of the animals that live in your chosen extreme environment. Analyse them to identify any commonalities.

1. What structural features and/or behaviours are common across the animals?

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2. Give a justified prediction of how global warming might affect the survival and future adaptations of the animals in your chosen environment.

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Adaptations

Name

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Purpose of assessment: Research structural and behavioural adaptations that assist animals to survive in their environment and use this information to develop explanations and predictions.

Understanding and skills			
Science understanding		Science inquiry skills	
Sections 1 and 2	Section 3	Sections 1, 2 and 3	
Analysis of how the form of living things enables them to function in their environments	Analysis of adaptations that are common to animals living in the same extreme environment; prediction of the impact of global warming on future adaptations	Communication of ideas, information and explanations	
<ul style="list-style-type: none"> Comprehensive explanation of how structural and behavioural adaptations assist animals to survive in their environment 	<ul style="list-style-type: none"> Identification of adaptations common to animals and justified prediction of how global warming might affect survival and future adaptations 	<ul style="list-style-type: none"> Clear and coherent communication of ideas, information and explanations 	A
<ul style="list-style-type: none"> Description of structural and behavioural adaptations of animals from different environments 	<ul style="list-style-type: none"> Identification of adaptations common to animals and prediction of how global warming might affect survival and future adaptations 	<ul style="list-style-type: none"> Communication of ideas, information and explanations 	B
<ul style="list-style-type: none"> Statement of isolated facts about adaptations 	<ul style="list-style-type: none"> Identification of adaptations common to animals 	<ul style="list-style-type: none"> Fragmented communication of ideas, information and explanations 	C
			D
			E
Australian Curriculum Year 5 Science	Adaptations	Task-specific standards — continua	

Adaptations

Name

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Purpose of assessment: Research structural and behavioural adaptations that assist animals to survive in their environment and use this information to develop explanations and predictions.

			A	B	C	D	E
Understanding dimension	Science understanding	Sections 1 and 2 Analysis of how the form of living things enables them to function in their environments	Comprehensive explanation of how structural and behavioural adaptations assist animals to survive in their environment	Explanation of how structural and behavioural adaptations assist animals to survive in their environment	Description of structural and behavioural adaptations of animals from different environments	Identification of structural and behavioural adaptations of animals from different environments	Statement of isolated facts about adaptations
		Section 3 Analysis of adaptations that are common to animals living in the same extreme environment; prediction of the impact of global warming on future adaptations	Identification of adaptations common to animals and justified prediction of how global warming might affect survival and future adaptations	Identification of adaptations common to animals and informed prediction of how global warming might affect survival and future adaptations	Identification of adaptations common to animals and prediction of how global warming might affect survival and future adaptations	Identification of adaptations common to animals and prediction of how global warming might affect survival	Identification of adaptations common to animals
Skills dimension	Communicating	Sections 1, 2 and 3 Communication of ideas, information and explanations	Clear and coherent communication of ideas, information and explanations	Clear communication of ideas, information and explanations	Communication of ideas, information and explanations	Narrow communication of ideas, information and explanations	Fragmented communication of ideas, information and explanations

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Current scientific conceptions and students' prior understandings

Current scientific conceptions

All living things have a common set of characteristics: they grow, move, reproduce, respire, excrete, require nutrition, and are sensitive and responsive to their environments. The display of any one of these characteristics, by itself, does not provide sufficient evidence of life; rather, it is a combination of most or all of these characteristics that indicates something is alive.

Students can be given repeated opportunities to refine and extend their understanding of what it means for an organism to be 'alive'.

There is a strong relationship between the observable features and behaviour of living things, their environments and their ability to obtain their needs. Particular living things have similar or different features and behaviours depending on similarities and differences in their environments and needs. For example, many animals in aquatic environments have fins, which help them to move in water, whereas many terrestrial animals have limbs, which enable them to move on land.

The features and behaviour of an animal or plant that enable it to survive in the environment in which it lives are referred to as 'adaptations'. A living thing's adaptations are most effective in its own environment. If its environment changes, these adaptations may no longer be effective and the living thing may have difficulty meeting its needs.

Students' prior understandings

Students' prior understandings may differ from current scientific conceptions in a range of ways.

Some students may have difficulties seeing the features of living things in terms of adaptation. They may think that the:

- features of a living thing are the result of its wishes or wants
- features of a living thing occur for a particular purpose.

It is likely that students will have had some prior experience in making links between the features of living things and the needs of those things — for example, they may relate the shape of a bird's beak to the food it eats, or the type of limb an animal has to the way it moves. Teachers can help students build on this prior experience and knowledge to develop a broader understanding of the relationship between living things' features, needs and environments.

Resource

Sourcebook modules provide teachers with a range of learning and teaching ideas. Teachers are encouraged to modify modules to meet the specific needs and interests of particular groups of students and individual students, their own needs and the learning environment.

QSA, Science (1999) sourcebook module > Life and living > Observable features and survival, www.qsa.qld.edu.au/992.html.