



Survival in Extreme Environments

YEAR 5 AND 6
BIOLOGICAL SCIENCES



QGC

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Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business aiming to increase awareness and understanding of the value of science, technology, engineering and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

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ELABORATE - EVALUATE

Survival in Extreme Environments

Teacher Resource

In this activity, students explore the adaptations that allow animals to survive in extreme environments. Students plan and conduct a hands-on investigation to answer the question/s below. Student groups may investigate one or both inquiry questions.

- Which animal will stay the coolest in a hot environment?
- Which animal will stay the warmest in a cold environment?

Detailed step-by-step instructions for this activity can be seen below. It is recommended that you use these instructions to guide students through the activity.

1. Facilitate a class discussion by posing the following questions:
 - Where is the coldest place you have ever been?
 - Where is the hottest place you have ever been?
 - How did you stay warm and keep cool in these places?
2. View a map of the world, and focus in on Australia and Asia. Ask students to predict where the hottest and coldest places might be for each continent. Students should justify their predictions.
3. Working as a class, or in small groups, visit the World Meteorological Organisation's [Global Weather and Climate Extreme Map](#). Identify the location and temperatures of the hottest and coldest places in Asia and Australia. Compare students' predictions with this information.

Year 6

Students calculate the difference in temperature for the:

- Hottest places in Australia and Asia.
 - Coldest places in Australia and Asia.
4. Students generate explanations for these extreme temperatures. Students may like to view images of these locations to assist this process. Ask students: ***How might the conditions of these places affect the animals that live there? How might an animal adapt to stay warm and keep cool in these places?***

Inform students that they will explore these questions in a scientific investigation. Students work in small groups to design and complete an investigation to explore which animals will stay the coolest in a hot environment and/or which animals will stay the warmest in a cold environment. Students could respond to one or both of the inquiry questions. If only responding to one question, student groups can share the results of their investigation with groups that completed the other investigation (i.e. student groups investigating cold environments can share their results with groups investigating hot environments and vice versa). The responses shared by students during the above class discussion could provide inspiration for students' scientific investigations.

5. After the investigation, you may like to discuss the following questions with students:
- Polar Bears live in cold, tundra habitats, and they are white. Explain how this adaptation helps the Polar Bear survive in its environment.
 - The fur of a Polar Bear is white, yet its skin is black. Explain how this adaptation helps the Polar Bear survive in its environment.
 - The Arctic Fox and Arctic Hare live in polar regions. These animals change their coat colours at different times of the year. In summer, their coat is a tawny brown. In winter, their coat is white. Explain how this adaptation helps these animals survive in their environment.
 - Some animals moult or shed their coat. Identify when an animal would do this, and explain how this adaptation helps these animals survive.
 - Other animals, like the Humpback Whale, do not have a coat, yet they can survive in freezing cold conditions. Explain how these animals survive in such conditions.

Curriculum Links

Science

YEAR 5

Science Understanding

Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)

Light from a source forms shadows and can be absorbed, reflected and refracted (ACSSU080)

Science as a Human Endeavour

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE081)

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSI231)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSI086)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSI087)

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSI090)

Compare data with predictions and use as evidence in developing explanations (ACSI218)

Reflect on and suggest improvements to scientific investigations (ACSI091)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSI093)

YEAR 6

Science Understanding

The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)

Science as a Human Endeavour

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098)

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSI232)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSI103)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSI104)

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSI107)

Compare data with predictions and use as evidence in developing explanations (ACSI221)

Reflect on and suggest improvements to scientific investigations (ACSI108)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSI110)

Mathematics

YEAR 5

Statistics and Probability

Pose questions and collect categorical or numerical data by observation or survey (ACMSP118)

Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)

Describe and interpret different data sets in context (ACMSP120)

YEAR 6

Number and Algebra

Investigate everyday situations that use integers. Locate and represent these numbers on a number line (ACMNA124)

Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128)

Statistics and Probability

Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)

Humanities and Social Sciences

YEAR 6

Knowledge and Understanding: Geography

The geographical diversity of the Asia region and the location of its major countries in relation to Australia (ACHASSK138)

Inquiry and Skills

Locate and collect relevant information and data from primary sources and secondary sources (ACHASSI123)

General Capabilities

Literacy

Comprehending texts through listening, reading and viewing

Composing texts through speaking, writing and creating

Numeracy

Estimating and calculating with whole numbers element

Using fractions, decimals, percentages, ratios and rates element

Interpreting statistical information element

Using measurement element

Information and Communication Technology

Investigating with ICT element

Creating with ICT element

Critical and Creative Thinking

Inquiring – identifying, exploring and organising information and ideas

Reflecting on thinking and processes

Analysing, synthesising and evaluating reasoning and procedures

Personal and Social Capability

Social management

Survival in Extreme Environments

Student Activity

Scientific Investigation: Extreme Heat

You will now design an experiment to investigate how different physical features help animals survive in extreme environments.

Aim

To investigate which animal will stay the coolest in a very hot environment.

Hypothesis

Select a physical feature to investigate. How will this feature affect an animal's ability to stay cool in a very hot environment? Write a prediction, giving reasons for your response.

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Variables

Identify the variables you are going to change, measure or observe and keep the same.

Change? (Independent variable)	Measure/Observe? (Dependent variable)	Keep the same? (Control variables)

Materials

List all of the equipment you will use in the experiment. Remember to include numbers and amounts.

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Method

List all of the steps you will take to conduct the experiment.

Risk Assessment

What safety considerations must be made before, during and after the experiment? Identify at least five risks and how to minimise them.

Risk	How to manage the risk


Recording Results

Record your results in a table. You could use Excel to create the table.

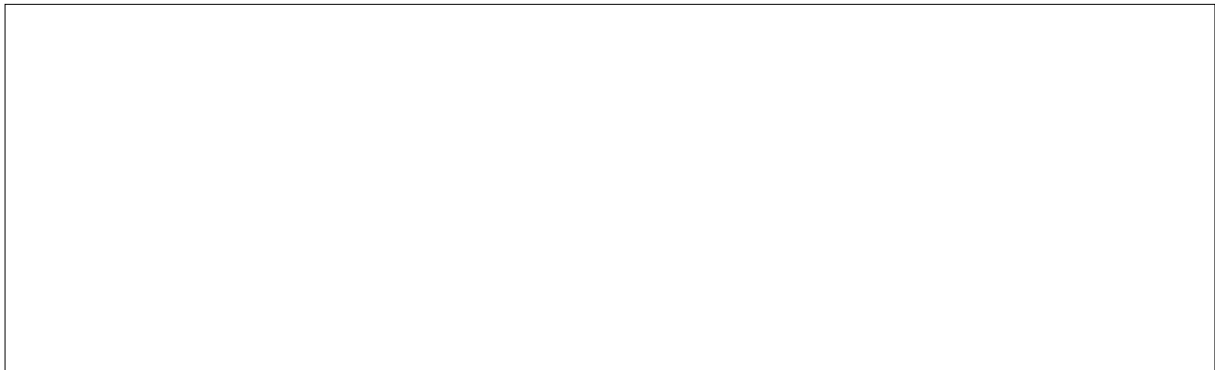
Represent this data in a line graph. You could use Excel to create the graph.

Analysing Results

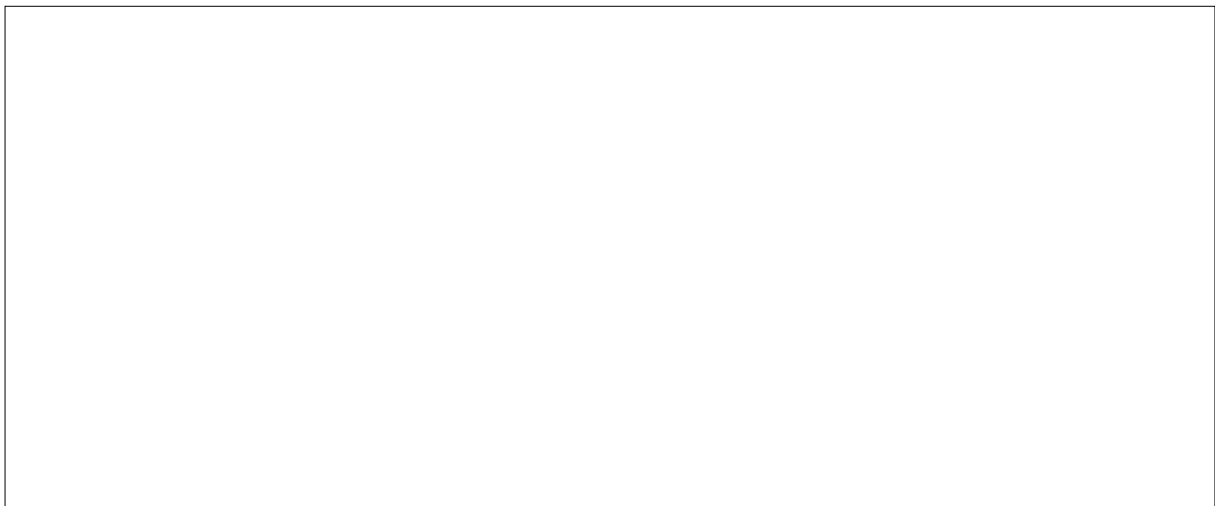
Summarise your results.



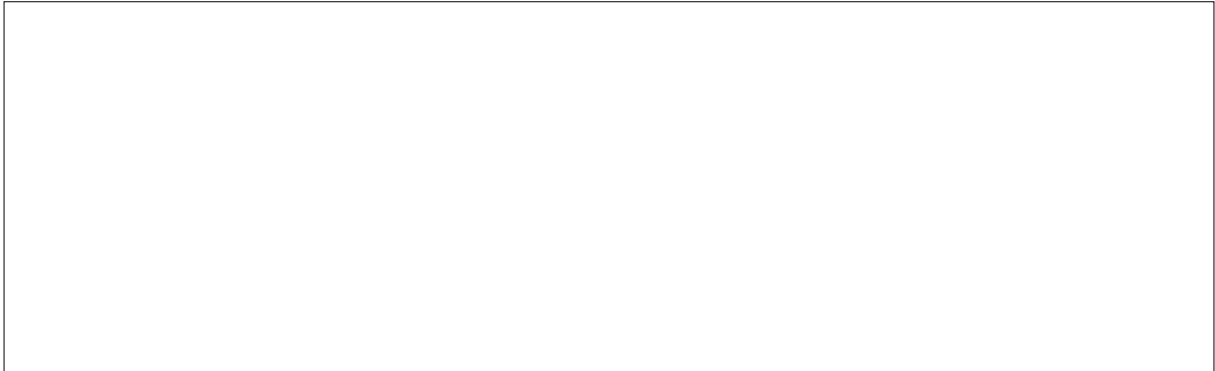
Explain your results. Use your results to determine which animal would stay the coolest in a very hot environment.



Were your original predictions supported by the data collected? Why or why not?



Evaluate the ability of this feature to help an animal survive in its environment.



Explain the other ways the animal might keep cool in a hot environment. You may like to conduct research to inform your response.



Explain how the animal may adapt if it were forced move to a cooler habitat.



Evaluating

Describe any challenges you experienced during the investigation.

Explain how you could improve the investigation.

Conclusion

Summarise the experiment and the results. Was the hypothesis supported or refuted?

Survival in Extreme Environments

Student Activity

Scientific Investigation: Extreme Cold

You will now design an experiment to investigate how different physical features help animals survive in extreme environments.

Aim

To investigate which animal will stay the warmest in a very cold environment.

Hypothesis

Select a physical feature to investigate. How will this feature affect an animal's ability to stay warm in a very cold environment? Write a prediction, giving reasons for your response.

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Variables

Identify the variables you are going to change, measure or observe and keep the same.

Change? (Independent variable)	Measure/Observe? (Dependent variable)	Keep the same? (Control variables)

Materials

List all of the equipment you will use in the experiment. Remember to include numbers and amounts.

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Method

List all of the steps you will take to conduct the experiment.

Risk Assessment

What safety considerations must be made before, during and after the investigation? Identify at least five risks and how to minimise them.

Risk	How to manage the risk

Recording Results

Record your results in a table. You could use Excel to create the table.

Represent this data in a line graph. You could use Excel to create the graph.

Analysing Results

Summarise your results

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Explain your results. Use your results to determine which animal would stay the warmest in a very cold environment.

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Were your original predictions supported by the data collected? Why or why not?

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Evaluate the ability of this feature to help an animal survive in its environment.

Explain the other ways the animal might keep warm in a very cold environment. You may like to conduct research to inform your response.

Explain how the animal may adapt if it were forced move to a warmer habitat.

Evaluating

Describe any challenges you experienced during the investigation.

Explain how you could improve the investigation.

Conclusion

Summarise the experiment and the results. Was the hypothesis supported or refuted?