



Modelling the Seasons

YEAR 5 AND 7
EARTH AND SPACE SCIENCES



QGC

FUTUREMAKERS



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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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EXPLORE – EXPLAIN – ELABORATE

Modelling the Seasons

Teacher Resource

In this inquiry-based activity, students will investigate how the tilt of the Earth's axis causes the seasons. This activity can be further modified by including measurements of the North Pole and South Pole. Black cardboard should be used for every point of measurement to increase the fairness of the experiment; this is because different colours absorb and reflect different wavelengths of light which would influence results.

If the experiment is not producing a measureable result, your light may not be producing enough heat. To increase heat on the world globe you could move the light closer to the world globe, or change the bulb. Heat lamps and incandescent bulbs produce the best result, followed by halogen lamps; higher wattage is preferable.

Light bulbs can get very hot. Do not leave the light on while unattended and remind students not to touch the light globes.

Thermochromic Globe

Another fantastic visual model includes using a colour changing globe. You can paint a globe with thermochromic paint which will change colour as it warms.

Curriculum Links

Science

YEAR 5

Science Understanding

The Earth is part of a system of planets orbiting around a star (the sun) (ACSSU078)

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

Science Inquiry Skills

With guidance, pose clarifying questions and make predictions about scientific investigations (AC SIS231)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (AC SIS086)

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (AC SIS087)

Compare data with predictions and use as evidence in developing explanations (AC SIS218)

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (AC SIS093)

YEAR 7

Science Understanding

Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the sun, Earth and the moon (ACSSU115)

Science Inquiry Skills

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (AC SIS124)

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (AC SIS125)

Measure and control variables, select equipment appropriate to the task and collect data with accuracy (AC SIS126)

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (AC SIS129)

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (AC SIS130)

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (AC SIS133)

General Capabilities

Critical and Creative Thinking

Inquiring: Identifying, exploring and organising information and ideas

Analysing, synthesising and evaluating reasoning and procedures

Modelling the Seasons

Student Activity

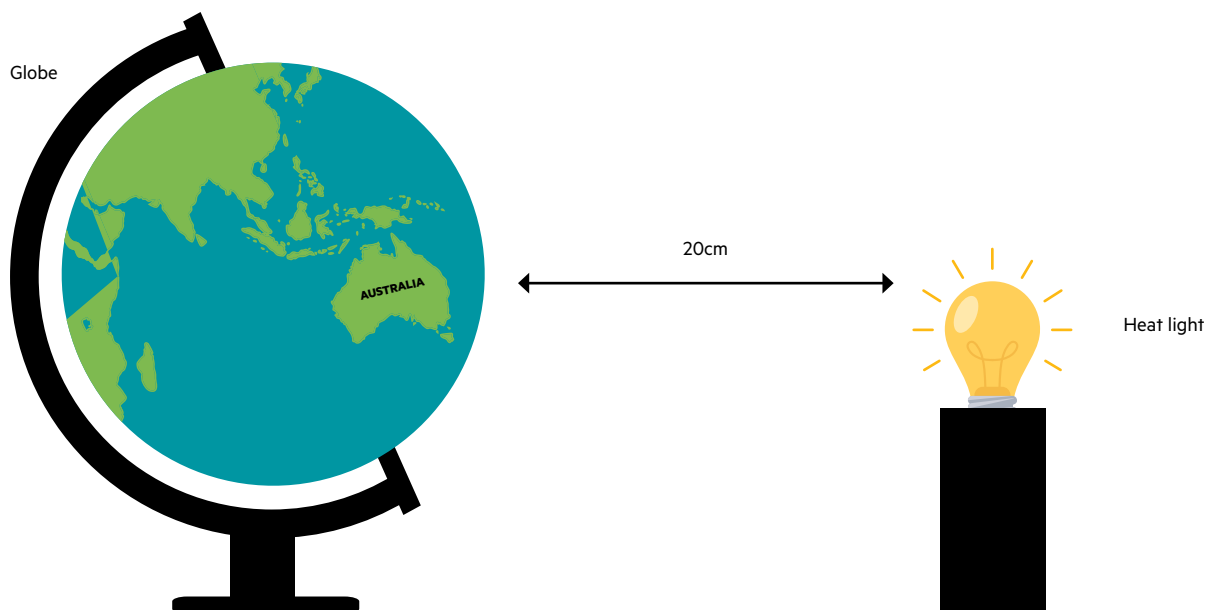
Australia is located in the Southern Hemisphere, to the south of the equator. How does this position affect our seasons?

Materials

- World Globe (25 cm diameter or larger)
- Infrared thermometer
- 2 x 2x2cm squares of black cardboard
- Heat light (some regular lamps may produce enough heat to conduct the experiment)

Method

1. Record the latitude and longitude of your location next to the (1) in the table below.
2. Place a 2x2 cm square of black cardboard over your location.
3. Place another 2x2 cm square of black cardboard over the corresponding location in the Northern Hemisphere. Record latitude and longitude next to the (2).
(Note: You can search the exact location with the same longitude and corresponding positive latitude in the Northern Hemisphere by copying your coordinates into Google Maps and removing the negative sign before the latitude).
4. Using an infrared thermometer, measure the 'before' temperature of both locations and record them in the table.
5. Set up your world globe and light as shown below.



Modelling the seasons material set-up

6. Switch on the light and leave for 15 minutes. Ensure your location is directly facing the heat lamp.

7. Make a prediction. What do you think you will observe after this time period?

8. Record the temperature at both locations.

Results


Title

Location	Latitude	Longitude	Temperature	
			Before	After
(1)				
(2)				

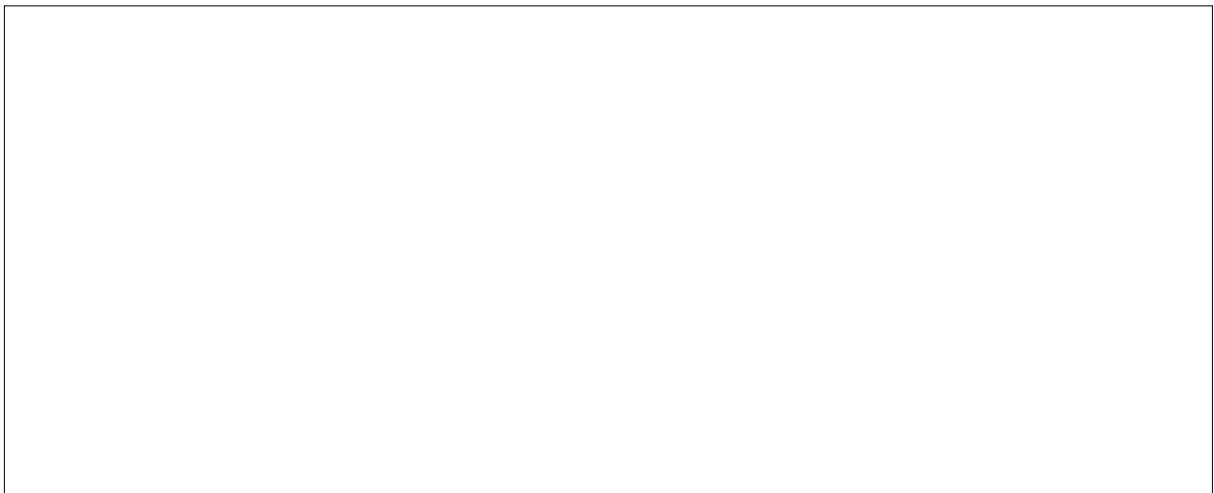
1. Record observations.

Discussion

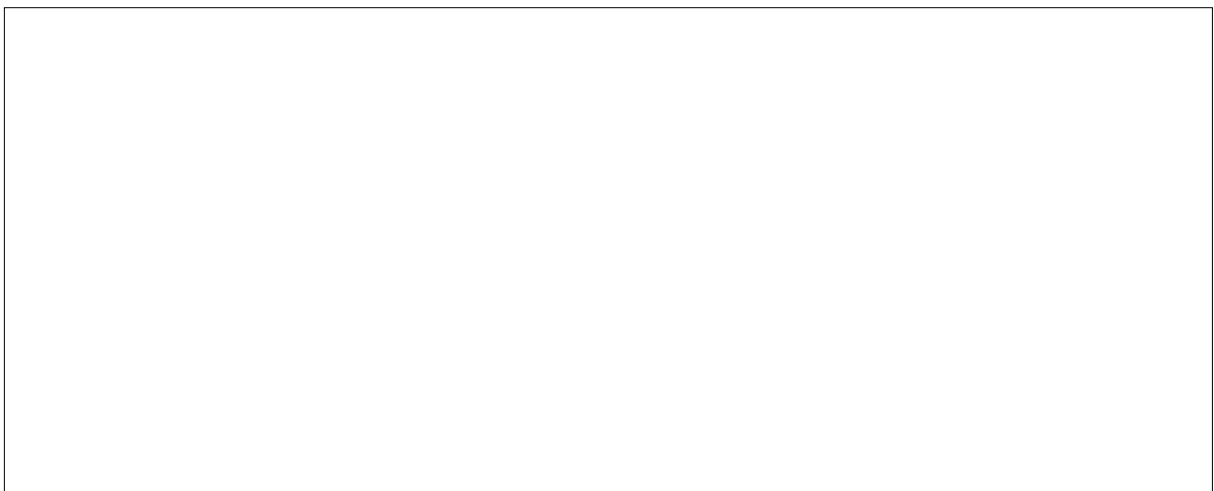
1. Discuss and explain the results. Was it as predicted? Why/why not?



2. What season/s does this represent? What else can you learn from this model?



3. Draw a labelled diagram explaining the location of Australia and the Sun during this season.



Opposite Seasons

Modify your model to represent the opposite season and repeat your experiment.

Title

Location	Latitude	Longitude	Temperature	
			Before	After
(1)				
(2)				

1. Record observations.

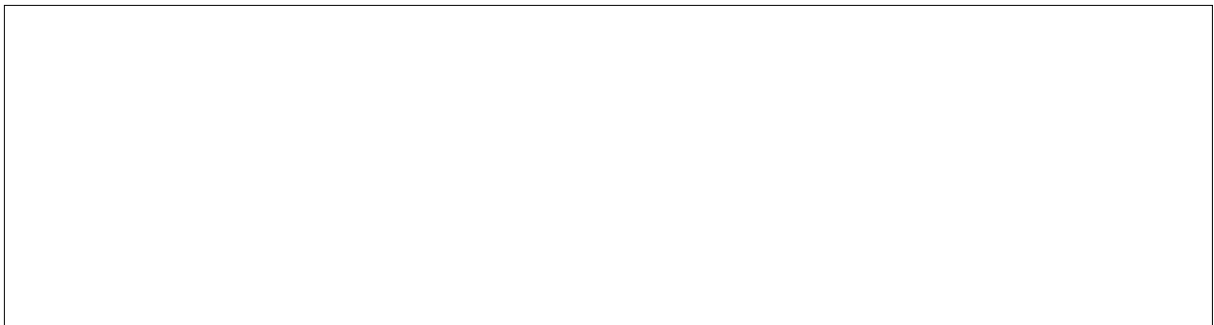
2. Discuss and explain the results.

3. What season/s does this represent? What else can you learn from this model?

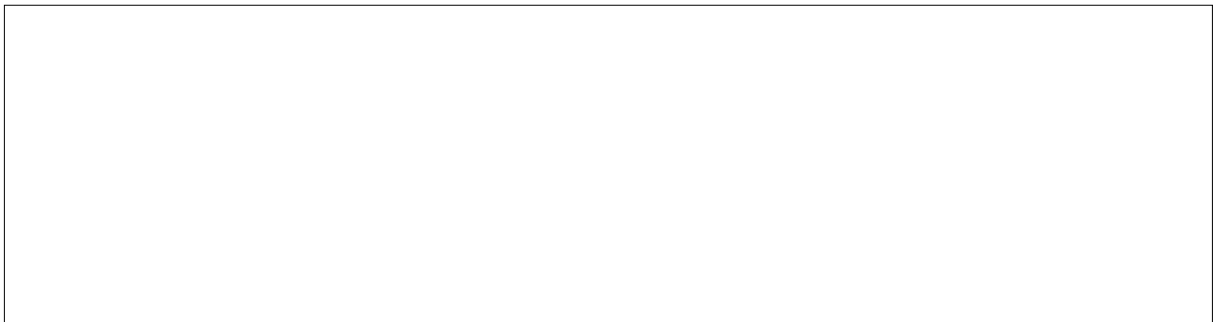
4. Draw a diagram explaining the location of Australia and the Sun during this season.



5. How could your model be improved?



6. Based on this experiment, why does the South Pole experience polar night during the winter?



Create a poster to explain what you have learnt from this model. You may also wish to include:

- Why are the poles cold all year long?
- Why is the equator hot all year long?
- Why is it colder at night than during the day?

