Topic 2 Systems in space: The Earth, Sun and Moon

Prior knowledge

Earth and the Moon move in orbits

1 The Earth spins on its axis once a day. The solar day is 24 hours long. That is the time it takes part of the Earth to point back at the Sun after rotating once.

2 The Earth orbits the Sun, approximately in a circle, once every year.

The pull of gravity

3 The force of gravity acting between the Earth and the Moon is attractive, so gravity pulls the Earth and Moon towards one another.

Cycles of the Moon and the tides

4 At any one place the tides in Earth's oceans go through a cycle of two high and two low tides each day.

5 The main cause of the tides in Earth's oceans is the gravitational force of the Moon pulling on the water. This force causes a bulge in the oceans towards the Moon which causes a high tide.

6 As the Moon moves around the Earth roughly every 27 days, its position relative to the Sun changes. This alters how much of the Moon's sunlit side is visible from Earth, causing the phases of the Moon.

7 Cycles of the Moon acted like a calendar allowing people to mark the passage of time throughout the year. This allowed them to know when to expect different seasons and food to become available. The tides allowed people access to food that lay beneath the water and to trap fish as the tide went out.

2.1 The Earth, Sun and Moon system

Check your understanding

SC1: I can describe the relative positions and sizes of Earth, the Sun and the Moon

From smallest to largest in size: the Moon is smaller than Earth is smaller than the Sun. In terms of distance from Earth, the Moon is much closer to Earth than the Sun.

SC2: I can describe the relative motion of Earth, the Sun and the Moon

The Earth orbits the Sun and the Moon orbits Earth.

SC3: I can explain the role of gravity in the movement of Earth, the Sun and the Moon

Gravity from Earth pulls the Moon towards it, while the Moon keeps moving forward. The balance between the Moon's motion and the pull of gravity towards Earth results in the Moon orbiting Earth. In the same way it is the force of gravity of the Sun acting on Earth that causes Earth to orbit the Sun.

Lesson review

1 The Sun is the largest by far. Next is the Earth and the Moon is the smallest.

2 The Sun can be represented by a basketball, Earth by a tennis ball, and the Moon by a marble with the moon near the Earth and the Earth at a significant distance from the Sun.

3 If Earth did not rotate on its axis, one side of Earth would always face the Sun and experience perpetual daylight, while the other side would be in constant darkness.

4 Earth orbits the Sun in an elliptical path taking about $365\frac{1}{4}$ days, while the Moon orbits Earth in an elliptical path taking about 27.3 days.

5 If the Sun's gravity suddenly disappeared, Earth would move in a straight line off into space instead of orbiting around the Sun.

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2.2 Cause of seasons

Check your understanding

SC1: I can explain why different parts of Earth experience different seasons at different times of the year

It is summer in Australia when it is winter in the Northern Hemisphere because Earth is tilted on its axis. When the Southern Hemisphere is tilted towards the Sun, it receives more direct sunlight and experiences summer, while the Northern Hemisphere, which is tilted away from the Sun, receives less direct sunlight and experiences winter.

SC2: I can suggest why Earth's tilt on its axis causes different parts of Earth to experience different light intensity

Earth's tilt causes different parts of Earth to receive sunlight at varying angles. When a hemisphere is tilted towards the Sun, it receives more direct and intense sunlight, resulting in warmer temperatures.

SC3: I can predict the season at a particular place on Earth based on Earth's tilt relative to the Sun

a Summer

b Winter

Lesson review

1 **a** The tilt of the Earth causes different parts of Earth to receive varying amounts of sunlight throughout the year. These varying amounts of sunlight cause higher or lower temperatures which is the seasonal changes in temperature that are observed.

b As Earth orbits the Sun, different hemispheres tilt towards or away from the Sun. The hemisphere (northern or southern) of the Earth tilted towards the Sun experiences summer, while the hemisphere tilted away from the Sun experiences winter.

2 The Northern Hemisphere experiences summer when the Southern Hemisphere experiences winter, and vice versa. Similarly, spring in one hemisphere corresponds to autumn in the other.

3 If Earth's axis were not tilted, there would be no significant seasonal changes, and most places would experience a consistent climate throughout the year.

4 **a** The equator receives more consistent and intense sunlight, while the poles experience extreme variations in light intensity across the year.

b Mid-latitudes experience moderate variations in light intensity with the seasons.

c The tropics will be most affected. The Sun hits the surface of the Earth at higher angles around the equator all year round, meaning the equator receives the most direct sunlight throughout the year.

2.3 Investigating the changing angle of the Sun

Hypothesis

The greater the angle at which light hits a surface, the greater the warming effect.

Prediction

A wooden block with light falling on it at a smaller angle (block A) should heat up less than a wooden block with light falling on it with a greater angle (block B).

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Results

Sample results are below.

Time (minutes)	Block A	Block B
	Angle of light = indirect	**Angle of light = direct**
	Temperature, *T* (°C)	**Temperature, *T* (°C)**
1	24	25
2	27	29
3	29	33
4	32	36
5	33	38

Conclusion

1 Block B models summer when Earth is tilted towards the light. Block A models winter when Earth is tilted away from the light.

2 Sample answers:

The experiment results do support the idea that there is a cause-and-effect relationship between the angle of sunlight and the temperature because there was a significant difference between the temperatures of the two thermometers. All other variables including the power of the lamp, the distance of the lamp and the temperature of the room were kept constant, so they would not have affected the measured temperature.

Or:

There was a small difference between the temperatures of the two thermometers. Other variables were controlled, but the power of the lamp may have varied during the experiment, and the distance of the lamp was hard to control with the thermometers at different angles. Therefore, I am not sure that any change in temperature was caused by the different angles of the blocks. Therefore, the experiment results do not support the idea that there is a cause-and-effect relationship between the angle of sunlight and the temperature.

Evaluation

Sample answer:

I was able to ensure the accuracy of the measurements by using a stopwatch to measure the time and making sure that I recorded the measurements on the scale of the thermometer correctly. To ensure this, two people in our team measured the temperature, while the third person called out the exact time.

2.4 Seasonal calendars

Check your understanding

SC1: I can describe how a group of First Nations Australians organise their seasonal calendar

Answers may include: changes in the environment, such as changes in weather, water supply, animal behaviour and plant life cycles.

They are also influenced by the appearance of certain constellations in the night sky.

SC2: I can explain how a group of First Nations Australians use a seasonal calendar to make predictions

The seasonal calendar gives a guide for the best times to do, or not do, certain things such as use fire, travel, hunt, fish and collect food and other resources.

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Lesson review

1 A seasonal calendar is a system that divides the year based on natural cycles and environmental changes. Seasonal calendars are often used to guide activities like hunting and farming.

2 The seasonal calendar is based on natural cycles and environmental events, while our modern calendar is based on a fixed number of days and months. The seasonal calendar is more flexible and closely tied to the local environment. The seasonal calendar allows a range of predictions to be made about natural cycles, particularly the availability of food at different times of the year.

3 **a** First Nations Australians use a seasonal calendar to track natural cycles and plan activities, such as the gathering of different food and travelling to where the food will be found.

b The seasonal calendar guides First Nations Australians in knowing the best times for hunting, fishing and gathering.

c The seasonal calendar is based on events like plant flowering and animal migrations.

4 **a** First Nations Australians can look at the constellation of the Celestial Emu and see how it appears at certain times of the year. At some times of the year it will be rising in the early evening and appear upright. At other times it will appear horizontal and later in the year be vertical again.

b When the Emu constellation is rising, First Nations Australians know that emus will be laying eggs soon and they can search for them to harvest food.

c Other signs, such as plants flowering, weather changes and other animal behaviours, can also indicate that it was the time of the year when emus lay their eggs.

2.5 Tides

Check your understanding

SC1: I can describe how the rotation of the Moon around Earth relates to the orbit of the Moon

The Moon rotates on its axis once every 27.3 days, the same amount of time it takes to orbit Earth, resulting in the same side of the Moon always facing Earth.

SC2: I can explain how the forces of gravitational attraction of the Moon and Sun affect water in Earth's oceans

a The Moon's gravity creates tides when it pulls on Earth's oceans, creating bulges (high tides).

b The Sun's gravity also affects tides, but to a lesser extent than the Moon due to its significantly greater distance from Earth.

SC3: I can explain the cause of neap and spring/king tides

a Spring tides are those with the greatest tidal range and they occur when the Sun, Moon and Earth are aligned.

b Neap tides occur when the gravitational attraction from the Sun and Moon act at right angles to each other, relative to Earth.

Lesson review

1 The Moon's rotation period matches its orbit around Earth (27.3 days), while Earth's rotation period (24 hours) is much shorter than its orbit around the Sun ($365\frac{1}{4}$ days).

2 If the Moon did not rotate on its axis, you would see different sides of the Moon over time instead of always seeing the same side as we do now.

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3 The Moon's gravitational force acting on the Earth's oceans is much stronger than the Sun's because the Moon is much closer to Earth. The Sun has much more mass than the Moon and can therefore exert a much stronger force. However, the Sun is at a much greater distance than the Moon so the effect of the force is greatly reduced.

4 Neap tides are less extreme because they occur when the gravitational pull from the Sun and Moon are at right angles to each other. The forces therefore counteract, reducing the combined effect on Earth's oceans.

2.6 Effects of tides

Check your understanding

SC1: I can use patterns in tidal data to make predictions

The first high tides on the days shown were at 1:04 am 1.77 m, 2:15 am 1.72 m and 3:26 am 1.70 m. Based on the trends shown in these times and heights the high tide on 15 May will occur at approximately 4:37 am with a height of about 1.69 m.

SC2: I can describe ways people use information about tides in society

Student answer may vary. Any two from:

- Analyse tidal charts to identify when high tides will start and end, and plan the fishing trip around these times.
- Sailors and boaters check tidal information to ensure safe navigation, avoiding shallow waters at low tide and taking advantage of high tide for easier docking and departure.
- Surfers check tidal charts to find the best waves, as tides influence wave height and quality.
- People use tidal information to generate electricity by operating tidal power plants during peak tidal movements to maximize energy production.

SC3: I can describe how a group of First Nations Australians use tidal patterns to predict the best time for foraging and fishing activities

Tidal charts are used to identify low tides when the shoreline is exposed, making it easier to forage for shellfish and other coastal resources.

Lesson review

1 Tidal data is information about the timing, height and frequency of tides. It can show patterns in the tides over time and help make predictions into the future.

2 **a** It is important to analyse tidal data to understand and predict tidal behaviour. Knowledge of tidal behaviour helps to plan a range of activities including navigation, fishing, recreation and energy generation.

b Patterns in tidal data provide insights into the timing and height of future tides.

c Future tidal events can be predicted by analysing past data, identifying patterns and extending the patterns into the future.

3 **a** Navigation uses tidal information for safe ship passage, while coastal management uses it for flood prevention and construction planning.

b Tidal information can be used to ensure safety and efficiency in various activities.

c Tidal information is crucial for safety, planning and managing coastal resources effectively.

4 **a** Following tidal patterns can help to determine when marine resources are accessible.

b Tides expose or submerge resources, affecting their availability.

c An understanding of tidal patterns allows First Nations Australians to efficiently and sustainably collect resources.

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2.7 Phases of the Moon

Check your understanding

SC1: I can name and describe the appearance of the key phases of the Moon

The eight key phases of the Moon are: new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, last quarter, waning crescent.

SC2: I can explain what causes the phases of the Moon

The cause of the Moon's phases is its orbit around Earth, which changes the portion of the Moon illuminated by the Sun that you can see from Earth.

SC3: I can predict the phase of the Moon for a given configuration of Earth, the Moon and the Sun

If the Moon is at a 90-degree angle to the line joining the Earth and the Sun, the Moon will be in either the first quarter or last quarter phase.

Lesson review

1 **a** A new moon is the phase when the Moon is appears dark.

b Waning gibbous is after the full moon phase.

c For a first quarter moon, half of the Moon is illuminated and visible from Earth.

2 During the full moon phase, the Moon is on the opposite side of the Earth relative to the Sun.

3 During the new moon phase, the Moon is positioned between the Earth and the Sun, causing the side of the Moon facing Earth to be in shadow.

4 By knowing the relative positions of the Sun, Moon and Earth, you can determine how much of the Moon's surface is illuminated and visible from Earth. First you should draw a diagram with the Sun, Moon and Earth in the positions you are interested in. Then shade the Sun, Moon and Earth in the positions you are interested in. Finally, you can then imagine what the Moon would look like from Earth, and you can predict what the phase of the Moon will be.

2.8 Modelling the phases of the Moon

Materials and safety

Possible materials: lamp; white ball, such as a Styrofoam ball; pencil; paper or notebook; camera
Possible safety note: Do not look directly at the light source

Results

	Position 1	Position 2	Position 3	Position 4	Position 5	Position 6	Position 7	Position 8
View of the Moon								

Conclusion

1 The amount of light that was visible on the 'Moon' increased between position 1 and position 5.

2 The amount of light that was visible on the 'Moon' decreased after position 5.

3 The 'Sun' and the 'Moon' were on opposite sides of 'Earth'.

4 Position 3 and position 7 both show light on about half of the face of the 'Moon'. In position 3 the light is on the left side, while in position 7 the light is on the right side.

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5 Position 1: new moon
Position 2: waxing crescent
Position 3: first quarter
Position 4: waxing gibbous
Position 5: full moon
Position 6: waning gibbous
Position 7: last quarter
Position 8: waning crescent

Evaluation

1 Answers may include:

A lamp or a torch was used to represent the Sun because the Sun is a light source.

A white ball was used to represent the Moon because the Moon is a sphere and its white surface reflects light.

My head was used to represent Earth because I needed to be able to see the view of the Moon from the perspective of Earth.

2 Answers may include:

Since you cannot go to outer space to observe the movement of the Moon in relation to the Sun and Earth, we needed to use a model to understand why the appearance of the Moon from Earth changes when its position changes and why we have different phases of the Moon.

3 Answers may include:

In reality, the Sun is suspended in space and light is emitted from the Sun in all directions. Using a lamp or a torch meant the direction of light was limited to one direction. The Sun would be better represented by a suspended globe light.

In reality, the size and distance relationships of the Sun, Earth and the Moon are very different. The Sun is much bigger and further away from Earth and the Moon. The scale of the objects would need to be changed to represent the system more accurately, but this would not be practical in the classroom.

2.9 Lunar eclipses

Check your understanding

SC1: I can describe what the Moon will look like during a lunar eclipse

During a total lunar eclipse, the Moon appears an orange-red colour, and the moon becomes much darker than it usually is. These changes in brightness and colour will occur over a few hours, gradually increasing and then the Moon will return to normal.

SC2: I can describe the relative positions of Earth, the Moon and the Sun during a lunar eclipse

During a total lunar eclipse, the Moon is directly behind Earth relative to the Sun, fully within Earth's umbra (the darkest part of its shadow).

SC3: I can explain, using a two- or three-dimensional representation, how Earth casts a shadow on the Moon during a lunar eclipse

Sample answer: Use a light source to represent the Sun, a ball to represent Earth, and a smaller ball to represent the Moon. Position Earth between the light source and the Moon, casting a shadow on the Moon to demonstrate the lunar eclipse.

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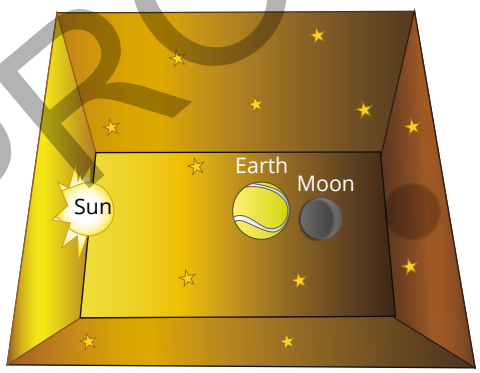
Worked example: Try yourself

USING MODELS IN EARTH AND SPACE SCIENCE

Create an annotated sketch to plan how you would go about making a 3D model of a lunar eclipse.

Thinking	Working
List the elements you need to represent with your model.	Sun Earth Moon sunlight shadow
Consider the placement of the Sun, Earth and the Moon in relation to each other.	The Sun, Earth and the Moon are aligned, with the Sun and the Moon on opposite sides of Earth.
Consider the relative sizes of, and distances between, the objects.	The Sun is bigger than Earth and Earth is bigger than the Moon. The distance between the Moon and Earth is smaller than the distance between Earth and the Sun.
Draw or make the model.	Collect objects that can be used to represent the Sun, Earth and Moon and consider appropriate presentation of the model. 

Lesson review

1 If you observe the Moon darkening and then turning red, you are witnessing a total lunar eclipse.

2 **a** A partial lunar eclipse darkens only part of the Moon, while a total lunar eclipse turns the entire Moon red.

b Both types of eclipse involve the Moon entering Earth's shadow.

c A total lunar eclipse is more dramatic and visually striking due to the complete and colourful change in the Moon's appearance.

3 A lunar eclipse does not occur every full moon because the Moon's orbit is tilted by about 5 degrees relative to Earth's orbital plane. As a result, the Moon usually passes above or below Earth's shadow instead of moving directly into it. A total lunar eclipse only occurs when the Sun, Earth and Moon align perfectly.

4 **a** A 3D model provides a more realistic representation, while a 2D diagram is simpler. A 3D model may also be able to move.

b 3D models are better for understanding spatial relationships; 2D diagrams are useful for quick reference and basic concepts.

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2.10 Cultural influence on knowledge about lunar eclipses

Plan

1 Sample answer:

Wang Zhenyi's love for both poetry and science were passed down to her from her family. Her grandfather taught her about astronomy, her grandmother taught her poetry, and her father taught her medicine, geography and mathematics. When she was 18 years old, she began to study astronomy on her own and wrote several articles, one of which was called 'On the explanation of a lunar eclipse'. This shows that she was a curious and dedicated learner who was passionate about sharing her knowledge with others. It is worth remembering that Wang Zhenyi's pursuit of knowledge and her involvement in science was not typical for women during her time. Culturally, it was considered unusual for women to be interested in science and have an education. However, Wang Zhenyi's family was supportive of her education and encouraged her to explore her interests in both poetry and science. Their encouragement and belief in her abilities allowed Wang Zhenyi to break down barriers and become a notable figure in astronomy, despite the social restrictions of her time. Her story serves as an inspiration to many, highlighting the importance of education and the power of supportive families in overcoming societal obstacles.

2 A lunar eclipse occurs when the Sun, Earth and the Moon align so that the Moon passes into Earth's shadow. The Moon becomes darker and may even turn red.

Design

1 Wang Zhenyi modelled lunar eclipses by placing a round table (using it as Earth) in a garden pavilion. From the ceiling of the pavilion she hung a lamp (using it as the Sun) and on one side of the table she had a big round mirror (as the Moon). Moving them around according to astronomy principles she could see how the lunar eclipse occurred. Her article 'On the explanation of the lunar eclipse' was highly accurate.

2 Models could include materials such as a lamp or other light source to act as the Sun, a circular reflective object to represent the Moon and another circular object to represent Earth.

Improve

1 Answers may include: the material chosen for Earth and the Moon to create a strong shadow.

2 Answers may include: the light source and the location chosen so that diffuse or other reflected light does not impact the model.

3 Answers may include: building their model within a cardboard box to block out other light sources.

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Evaluate

1 The culture of the Qing dynasty in the eighteenth century was explored in terms of how women were expected to play a limited role in society and their opportunities for education and careers were restricted. The life of Wang Zhenyi was explored including her childhood, studies and interests.

2 Answers should include: research skills (such as evaluating sources), planning/designing skills, modelling skills and reflection/evaluation skills.

2.11 Solar eclipses

Check your understanding

SC1: I can describe what the Sun will look like during a solar eclipse

Solar eclipses only occur when there is a new moon and the Sun is blocked by the Moon. This means that the light from the Sun is blocked and only the outer atmosphere of the Sun is visible.

SC2: I can describe the relative positions of Earth, the Moon and the Sun during a solar eclipse

A solar eclipse occurs when the Moon moves directly between Earth and the Sun, blocking sunlight and casting a shadow on Earth.

SC3: I can explain, using a two- or three-dimensional representation, how the Moon casts a shadow on Earth during a solar eclipse

A 2D model can more clearly illustrate how the Moon casts a shadow on Earth, particularly by showing the umbra and penumbra in detail.

Lesson review

1 During a total solar eclipse, the Sun is completely obscured by the Moon, and the Sun's outer atmosphere becomes visible as a halo of light around the Moon.

2 **a** The Sun is obscured during a total solar eclipse because the Moon passes directly between Earth and the Sun, blocking its light from reaching Earth.

b During a solar eclipse, the Moon blocks the Sun's light, casting a shadow on Earth. This can only occur when the Moon is between the Sun and Earth.

c In a partial solar eclipse, only part of the Sun is obscured; in a total solar eclipse, the entire Sun is obscured.

3 During a solar eclipse, the Moon is between Earth and the Sun. During a lunar eclipse, Earth is between the Sun and the Moon.

4 **a** The umbra is the full shadow where the Sun is completely obscured, while the penumbra is the partial shadow where the Sun is only partially obscured.

b From the umbra, the Sun appears completely obscured, and the Sun's outer atmosphere appears as a glowing halo around the Moon.

5 **a** Answers will vary. An example is: A large ball for Earth, a smaller ball for the Moon and a lamp for the Sun.

b To model a solar eclipse, position the lamp (Sun) to shine on the large ball (Earth), then place the smaller ball (Moon) between Earth and the Sun, casting a shadow on Earth.

c To show the transition from penumbra to umbra, gradually move the 'Moon' into the path of the light. Initially, a partial shadow (penumbra) appears, and as the Moon fully blocks the 'Sun,' the darker central shadow (umbra) forms, creating a total solar eclipse.

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2.12 Exploration of the Moon

Plan

Answers may include gaining evidence about the formation and structure of the Moon. They may also discuss the political reasons in terms of the competition between the United States and the Soviet Union as part of the Space Race, including honouring the promise of President John F. Kennedy to send a person to the Moon by the end of the decade (the 1970s).

Design

1 Answers may include discussions about the technological advances in rockets, satellites, miniaturisation of devices and technologies, global network of ground stations, telescopes, drones and robots. Developments specific to the exploration of the Moon include orbiting, which involves sending a spacecraft to circle the Moon and collect data using sensors and cameras, and unmanned landing used to collect samples.

2 Answers may include: space tourism, scientific research (especially around useful minerals on the Moon), investigation into the possibility of sustaining human life on the Moon and using the Moon as a staging post for missions to Mars (due to the reduced gravity on the Moon, which means less fuel is required for spacecraft takeoff).

3 Answers will vary depending on their chosen method of presentation, but should include key headings and a clear structure that compares the changes in technologies.

Conduct

Presentations will vary depending on the guidance provided by teachers, but should use information about the original moon landings to compare to the current exploration of the Moon. They should include specific examples of the influence of technological advances on these changes.

Improve

Answers should include specific changes and the reasons why these changes would improve the clarity, engagement or the accuracy of the presentation.

Evaluate

Answers may include references to knowledge of historical space exploration and current space exploration and research, as well as communication and collaboration skills (if carried out as a group activity).

Topic review

Remember

1 The tilt of Earth's axis and its orbit around the Sun cause different parts of Earth to experience different seasons.

2 A seasonal calendar is a way of dividing the year based on natural events and cycles, such as weather patterns, plant growth, and animal behaviours. It helps First Nations Australians track the changes in nature and plan their activities accordingly.

3 The Moon rotates around its axis while simultaneously orbiting Earth. This rotation and orbit are synchronised, causing the same side of the Moon to always face Earth.

4 **a** The Moon appears round when it is a full moon.

b The Moon cannot be seen from Earth when it is a new moon.

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Understand

5 Earth orbits the Sun and the Moon orbits Earth. The Sun is at the centre of the solar system.

6 When the Southern Hemisphere is tilted towards the Sun, it receives more direct (intense) sunlight, and therefore experiences summer. Six months later, the Southern Hemisphere is tilted away from the Sun, receiving less direct sunlight, meaning that winter is experienced.

7 Sample answer: Phoebe should position the light source at different angles to the flat surface and measure the temperature with a thermometer at each angle.

8 Sample answer: Collect two balls and a light source. Position the balls to represent Earth and the Moon, with the light source acting as the Sun. Rotate the 'Moon' around 'Earth' to show how the illuminated portion changes, creating the different phases.

9 During a lunar eclipse, Earth must be positioned between the Sun and the Moon, casting a shadow on the Moon. Without this alignment, Earth cannot cast a shadow on the Moon.

Apply

10 If Earth's axis were tilted such that the North Pole faced towards the Sun in January it would result in an extreme summer in the Northern Hemisphere and the Southern Hemisphere would be in an extreme winter. The situation would be reversed in July with the hemispheres experiencing an extreme version of the opposite season. This extreme tilting of the Earth would cause a complete swap of seasons between hemispheres, with each experiencing much more intense versions of the opposite season than usual.

11 By observing the seasonal calendar, you can determine the best times for planting, harvesting and other agricultural activities based on natural cycles.

12 The Apollo missions were driven by political competition and scientific exploration, while current missions focus more on long-term habitation and resource utilisation.

Analyse

13 The gravitational pull of the Moon on Earth is the same size as the gravitational pull of the Earth on the Moon, however, the two forces act in opposite directions and on two different objects.

14 Spring tides occur when the Sun, Moon and Earth are aligned, leading to higher high tides and lower low tides. Neap tides occur when the attractive forces of the Sun and Moon are at right angles to each other, leading to less extreme tides.

15 The model would represent a lunar eclipse. Light from the Sun would be blocked by the Earth and the Moon can move into this shadow which is what occurs when a lunar eclipse occurs.

Extension: Research

16 Some nocturnal animals, such as certain predators, may hunt more effectively during a full moon due to increased visibility, while others may become more cautious to avoid being seen.

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