Chapter 9: Earth, Sun and Moon

9.1 The Earth, Sun and Moon interact with each other

Student book answers (pages 156–157)

Check your learning 9.1

Remember and understand

1 What is the difference between ‘rotation’ and ‘orbit’?

Rotation refers to the movement of the Earth on its own axis. Orbit refers to the movement of the Earth around the Sun.

2 Match these terms with the listed explanations: *day, night, year*.

a experienced by the part of the Earth that is facing away from the Sun

Night

b name for the rotation of the Earth over 24 hours

Day

c time for the Earth to orbit the Sun once

Year

3 Why do we have a leap year every four years?

A year is 365.25 days, or 365¼ days, so we have three years of 365 days and then one year of 366 days to make our calendar more accurate.

4 What is the difference between total and partial solar eclipse?

In a total eclipse all the Sun’s light is blocked out. In a partial eclipse only some of the Sun’s light is blocked.

Analyse and apply

5 Why couldn’t you in Melbourne and a friend in Darwin see exactly the same solar eclipse?

You can’t see exactly the same solar eclipse in Melbourne and Darwin because of their different locations on the Earth’s surface. The different locations will result in different places having a different perspective or view of the event.

Evaluate and create

6 Compare the different time zones around the world. Describe what people in America, China, Africa and France be doing while you are having lunch.

Student answers will vary. At lunchtime in Australia (approximately 1.00 pm), it is approximately:

**•** 14–17 hours behind in America (so late evening of the day before, going into night)

**•** 2 hours behind in China, so late morning

**•** 7–10 hours behind in Africa (so very early in the morning but still night)

**•** 8 hours behind in France (so very early in the morning but still night)

9.2 The Moon reflects the Sun’s light

Student book answers (pages 158–159)

Check your learning 9.2

Remember and understand

1 True or false?

a The Moon creates light

False. The Moon reflects light from the Sun.

b The Moon does not supply light to the Earth

False. The Moon can reflect some light to Earth at night.

c The Moon changes shape during different phases

False. It stays spherical; however, we can only see part of it, making it look like different shapes.

d Tides are controlled by the Sun

True. Gravity from both the Sun and Moon controls tides; however, the Moon is mostly responsible for the effects.

OR

False. The Moon has the major effect on the tides on Earth.

e The Moon is the closest body in space to the Earth

True

f Craters are large indentations on the Moon’s surface

True. The craters are usually the result of meteor impacts.

g Astronomers are pseudoscientists

False. Astronomy is considered to be a science and is one of the oldest sciences. Astrologists are pseudoscientists.

h The Moon is small compared to other moons in our solar system

False. Some moons are actually the same size or smaller than Earth’s moon. Our Moon is the fifth largest.

i We can see both sides of the Moon from Earth

False. The Moon doesn’t rotate fast enough for this to occur. From Earth, no one has ever seen the far side of the Moon.

Apply and analyse

2 The Greek scientist Aristotle noticed that, during lunar eclipses, the Earth’s shadow was always round. How did this lead him to suggest the Earth was spherical in shape?

Student answers will vary. Typically, a solid object with a circular shadow is a sphere.

Evaluate and create

3 Research an alternative explanation for the phases of the Moon as told by early Indigenous Australians. How did they explain the variation in the appearance of the Moon?

Student answers will vary.

9.3 Seasons are caused by the tilt of the Earth

Student book answers (pages 160–161)

Check your learning 9.3

Remember and understand

1 Match the four seasons experienced in Australia with the letter on Figure 9.14.

a summer

b spring

c winter

d autumn

2 What is the angle of the Earth’s rotational tilt away from the Sun?

23.5°

Analyse and apply

3 Use the motion of the Earth around the Sun to explain why January is hotter than July in Australia.

January is hotter than July in Australia because the southern hemisphere is tilted towards the Sun in January.

Evaluate and create

4 What other evidence can you find that the traditional inhabitants of Australia were aware of celestial events such as eclipses and the phases of the Moon?

Student answers will vary.

9.4 Science as a human endeavour: Astronomers explore space

Student book answers (pages 162–163)

Extend your learning 9.4

1 How does a telescope help us view distant objects?

A telescope collects light and focuses this light using lenses and mirrors, making the distant object appear brighter and larger.

2 What sort of information are we looking for when we launch probes into space?

When we launch probes into space we are looking to learn more about the solar system and the universe, and to search for places that might support life.

3 What is the purpose of the Mars exploration rovers?

The purpose of the Mars exploration rovers is to find out more about Mars, including its climate and geology.

Apply and analyse

4 Why is the discovery of water on Mars so important?

Student answers will vary. Typically, water is necessary for life, so discovering water on Mars means life may exist or have existed on Mars.

5 What sort of knowledge about our universe has been gained by launching space probes?

Knowledge gained by launching space probes includes discovering information about the climate, atmosphere and geology of different planets.

Evaluate and create

6 Imagine you are an astronomer with NASA. Prepare a list of reasons explaining the importance of maintaining the Hubble Space Telescope instead of relying on traditional telescopes on the Earth’s surface.

Student answers will vary. Typically, the Hubble Space Telescope can give scientists a view of the universe far beyond that of any ground-based telescope because it is above the Earth’s atmosphere and doesn’t suffer the same amount of distortion as ground-based telescopes. The images beamed back to Earth from the Hubble Space Telescope have enabled astronomers to make an enormous number of new observations, and it is hoped that by maintaining the Hubble Space Telescope this will continue into the future.

Review 9

Student book answers (pages 164–165)

Remember and understand

1 What causes day and night?

Night and day are created by the Earth’s 24-hour rotation on its axis.

2 What is the name for one revolution of the Earth around the Sun?

The word ‘orbit’ describes one revolution of the Earth around the Sun.

3 During summer in Australia, what is the season in Norway?

During summer in Australia, Norway is having winter.

4 What do we call the event when the Moon totally blocks the light from the Sun?

A ‘total solar eclipse’ is the term used when the Moon totally blocks the light from the Sun.

5 How does the Sun affect day and night and seasons at the Earth’s two poles?

The tilt of the Earth on its axis causes different regions of the Earth to experience periods of time with different amounts of heat and light. This creates seasons. The Earth rotates around the Sun once every 24 hours, with different parts of the Earth facing towards or away from the Sun, creating day and night.

6 Look at Figure 9.21, which shows a total eclipse of the Sun as it would be seen in the middle of the day from the Earth. Draw and label a diagram to illustrate how:

a a solar eclipse may occur

In a solar eclipse, the Moon moves between the Earth and the Sun.

b a lunar eclipse may occur.

In a lunar eclipse, the Earth moves between the Moon and the Sun.

Apply and analyse

7 What is the difference between astronomy and astrology?

Astrology is the forecasting of a person’s future based on their birth date. Astronomy is the study of the universe.

8 Why does 29 February only occur every four years?

We need one extra day every four years in order to make our calendar more accurate. This is achieved by adding 29 February once every four years.

9 Figure 9.22 shows how the seasons occur. Answer A or B to each question.

a Which of the two drawings represents summer?

A

b If the piece of card was the Earth, in which case would the Sun be most overhead?

A

c If the piece of card was the Earth, which one would give warmer days?

A (because the heat is concentrated in a smaller area)

10 The Persian calendar celebrates the New Year at the moment the sun crosses the celestial equator on approximately 21 March each year. In 2014 it was celebrated at 4 am on the east coast of Australia. In 2015 it was celebrated at 10 am. Explain why the exact time of the New Year changes from one year to the next.

Our calendar is not perfectly accurate and so we add one day extra every four years. This equates to ¼ of a day per year, which is 6 hours. The difference between 4 am in 2014 and 10 am in 2015 is also 6 hours.

11 A student claims that the Moon is a mini Sun that shines at night. Are they correct? Provide evidence to support your argument.

No, the Moon only reflects the Sun’s light, it does not create its own light like our Sun does. Therefore, the Moon cannot be considered to be a mini Sun.

12 What is the purpose of the Hubble Space Telescope?

The Hubble Space Telescope gives scientists a view of the universe far beyond that of any ground-based telescope because it is above the Earth’s atmosphere and doesn’t suffer the same amount of distortion as ground-based telescopes.

Evaluate and create

13 When will the next solar eclipse occur? Which country or countries will see the total eclipse?

Student answers will vary depending on which date this question is attempted.

14 Study Figure 9.23 and answer the following questions.

a In which season do we get the longest shadows?

Winter

b Which season gives the least opportunity for solar heating?

Winter

c In which season does the Sun travel furthest across the sky?

Summer

d On which side of the house is it best to grow plants that like sunlight?

On the north side of the house

e If a plant is growing on the eastern side of a house, will it receive sun in the morning or afternoon?

Morning

15 Could humans colonise the Moon? Explain your answer?

Humans could not colonise the Moon because there is no atmosphere on the Moon, which means humans could not breathe.

16 Find data for the sunrise and sunset times over 7 days in summer and winter. From this information, calculate the length of the day and the length of the night. Present your findings in a table. What do you notice about the length of the days and nights for each season? How can you explain the difference?

The length of the day and length of the night will vary depending on the days students get data; however, the days will be longer in summer and shorter in winter. Conversely, nights are shorter in summer and longer in winter. The differences can be explained by the distance between the Earth and Sun at these times. Because of the Earth’s tilt, places experiencing summer are closer to the Sun than they are in winter.

17 Many early Europeans claimed the early Indigenous Australians didn’t use any of the sciences. Provide evidence that refutes this claim.

Student answers will vary.