

4.3 The Earth

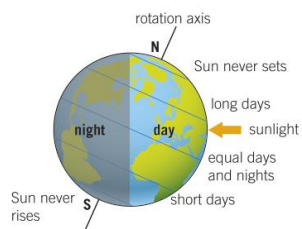
Learning objectives

After this topic you will be able to:

- explain the motion of the Sun, stars, and Moon across the sky
- explain why seasonal changes happen



▲ This photograph of the night sky was taken over 10.5 hours.



▲ When the Earth spins, half the Earth is in the light and half is in the dark.

Is the Earth special? Astronomers have discovered hundreds of planets orbiting other stars. They call these exoplanets. So far Earth is the only planet known to contain life.

The spinning Earth

The Earth spins on its **axis**. If you take a photograph over a long time the stars appear to move in circles. This shows that the Earth is spinning.

A Describe how you can demonstrate that the Earth is spinning.

There is **day** and **night** on Earth because Earth spins on its axis. It takes 24 hours to complete one full spin.

The Sun rises in the east each morning, reaches its highest point at noon, and then sets in the west in the evening. The Sun isn't moving. You are.

B State the direction in which the Sun rises.

The orbiting Earth

The Earth moves around the Sun once each **year**. The Earth takes 365.2422 days to orbit the Sun. There is an extra day in a leap year every four years.

Spin and orbit

Write the shortest sentence that you can to explain day length and year length using these words:

spin, day, night, orbit, year

Over the year the height of the Sun at noon, average daily temperature, and stars that you see at night all change during the different **seasons**.

The Earth's axis is tilted by 23.4°.

It is hotter in the summer than the winter because the tilt of the Earth's axis means that the Sun's rays spread over a smaller area and the days are longer.

In the summer in the North Pole the tilt of the axis means that the Sun doesn't set. This is called the 'Land of the Midnight Sun'. In the winter the Sun does not rise, giving a 'polar night'. This also happens at the South Pole.



▲ The Sun never sets – this shows the Sun in the Arctic over a 24-hour period in the summer.

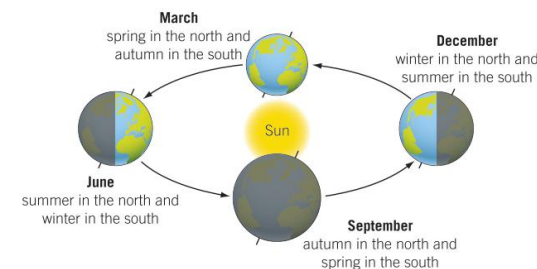
Key Words

exoplanet, axis, day, night, year, season, constellation

February 29th?

It takes 21 600 seconds longer to orbit the Sun than just the 365 days you use for one year. Show that in 4 years these extra seconds add up to one whole day.

The groups of stars, or **constellations**, that we see in the summer at night are different to the stars that we see in the winter. This is because the Earth is moving around the Sun. The side of the Earth that has night is facing different stars at different times of the year.



▲ The Sun's light is spread out over a bigger area in the winter.

Summary Questions

- 1 Copy the sentences below, choosing the correct bold word. You see the Sun rise in the **east/west** and set in the **east/west** because the Earth **spins/orbits**. A **month/year** lasts approximately 365 days. This is the time that it takes the Earth to **orbit the Sun/spin once**. The days are **longer/shorter** in the summer and the Sun is **higher/lower** in the sky at noon.

(7 marks)

- 2

a Explain why it is hotter in the summer than it is in the winter. (2 marks)

b Explain why the shadow of a fence post is longer in the winter than in the summer. (1 mark)

- 3 Explain in detail what you would experience throughout the year if the axis of the Earth was not tilted. (6 marks)