

Exercise walk-through

Solar Radiation and Earth's Seasons ■ 4.7

eXercise

You must be able to

- explain that seasons come from Earth's **axial tilt** 地轴倾斜
- link the angle of sunlight to intensity
- explain why the equator is warm year-round

Method — Seasons come from the tilt

Earth's axis is **tilted** about 23.5° . As Earth orbits the Sun, each hemisphere tilts **toward** the Sun (summer) or **away** (winter). Seasons are **not** caused by distance from the Sun.

Method — Angle and intensity

Sunlight hitting at a **high angle** (near vertical) is concentrated → **more intense, warmer**. Sunlight at a **low angle** spreads over a larger area → **less intense, cooler**.

Method — The equator

The **equator** receives near-vertical sunlight all year, so it is consistently warm with little seasonal change.

Method — A worked reasoning

In a hemisphere's summer, it tilts toward the Sun, so sunlight strikes at a higher angle and days are longer, making it warmer.

Practice 2.1 ■ 1 mark

What causes Earth's seasons?

Solution 2.1

Method: Seasons come from the tilt

Worked steps

Earth's axial tilt (as it orbits the Sun) **B1**.

Practice 2.2 ■ 1 mark

Does high-angle or low-angle sunlight deliver more energy per area?

Solution 2.2

Method: Angle and intensity

Worked steps

High-angle sunlight **B1**.

Practice 2.3 ■ 1 mark

Why is the equator warm all year?

Solution 2.3

Method: The equator

Worked steps

It receives near-vertical (high-angle) sunlight all year **B1**.

Exam-style 3.1 ■ 1 mark

Earth's seasons are caused by its

A distance from the Sun

B axial tilt

C rotation speed

D magnetic field

Solution 3.1

Method: Seasons come from the tilt

A distance from the Sun

B axial tilt 

C rotation speed

D magnetic field

Worked steps

B — axial tilt.

Exam-style 3.2 ■ 2 marks

In June, the Northern Hemisphere experiences summer.

- (a) Explain how the axial tilt causes this.
- (b) State how the angle of sunlight differs from winter.

Solution 3.2

Worked steps

(a) In June the Northern Hemisphere tilts toward the Sun, so it receives more direct sunlight and longer days, making it warmer **M1 A1**. (b) Sunlight strikes at a higher angle than in winter **B1**.

Exam-style 3.3 ■ 2 marks

Explain why high-latitude regions are colder than the equator.

Solution 3.3

Worked steps

At high latitudes sunlight strikes at a low angle, spreading the energy over a larger area, so it is less intense and colder than the near-vertical sunlight at the equator

M1 **A1**.