

4.7 Solar Radiation and Earth's Seasons

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS axial tilt 地轴倾斜

Objective

Build the skills to answer exam questions on **solar radiation and Earth's seasons**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

■ 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**.

■ The equator

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

■ 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.

2 Practice

Now apply the methods above.

2.1 What causes Earth's seasons? [1]

2.2 Does high-angle or low-angle sunlight deliver more energy per area? [1]

2.3 Why is the equator warm all year? [1]

3 Exam-style questions

3.1 Earth's seasons are caused by its [1]

- **A** distance from the Sun
 - **B** axial tilt
 - **C** rotation speed
 - **D** magnetic field
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3.2 In June, the Northern Hemisphere experiences summer.

(a) Explain how the axial tilt causes this. [2]

(b) State how the angle of sunlight differs from winter. [1]

3.3 Explain why high-latitude regions are colder than the equator. [2]

Solutions

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

2.2 High-angle sunlight.

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

3.1 B — axial tilt.

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

3.3 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.