Sunlight by Latitude

Trace how Earth's shape and tilt affect regional climates

6.10.b "Construct explanations of how the tilt and curvature of the Earth cause unequal heating of its surface, resulting in regional climates based on patterns of latitude."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the words that explain how Earth's curve spreads sunlight, and circle the words that explain how its tilt changes sunlight through the year.

Three Tents, One Sun

1. Imagine three solar-powered research tents placed along one north-south trail. One sits near the equator, one in the middle latitudes, and one close to a pole. All three receive sunlight from the same Sun, but Earth is curved. Near the equator, incoming rays strike the ground more directly, so their energy is packed into a smaller area. Closer to a pole, rays arrive at a slant and spread the same amount of energy over more ground. The slanted rays also pass through more atmosphere, which can reduce the energy that reaches the surface.

2. Now picture the tents six months apart, in January and July. Earth's axis stays tilted in the same direction as Earth travels around the Sun. In July, the Northern Hemisphere leans toward the Sun. Its middle and high latitudes get longer days and more direct rays than they do in January, so summer brings more heating. At the same time, the Southern Hemisphere leans away and has winter. Near the equator, day length and the Sun's angle change less over the year, so sunlight stays fairly strong across seasons.

3. Climate describes usual conditions over many years, not just today's temperature. Because curved Earth spreads sunlight unevenly, places near the equator tend to have warm climates, while places near the poles tend to be cold. The tilt changes which hemisphere gets stronger sunlight during each part of the year, so many middle-latitude regions have warm summers and colder winters. At high latitudes, the length of daylight changes greatly between summer and winter. Ocean currents, elevation, and winds can change a region's climate, but latitude helps explain the broad pattern of heating.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does Earth's curved surface cause the tent near a pole to receive less concentrated sunlight than the tent near the equator?

2. Why does the Northern Hemisphere receive more solar heating in July than in January?

3. Why does sunlight near the equator change less across seasons than sunlight at higher latitudes?

4. How do Earth's curvature and tilt help explain warm summers and colder winters in many middle-latitude regions?

3 YOUR TURN

Your own words

An explorer plans July visits to three sites: 15°S, 55°S, and 80°S. In four sentences, predict which site usually gets the most solar heating and which gets the least, explain how Earth's curve and tilt lead to this pattern, and link the heating to broad regional climates.

ANSWER KEY

Sunlight by Latitude

GRADE 6 · 6.10.b

PART 1 · READ AND MARK

Underline the words that explain how Earth's curve spreads sunlight, and circle the words that explain how its tilt changes sunlight through the year. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does Earth's curved surface cause the tent near a pole to receive less concentrated sunlight than the tent near the equator?	**Near a pole, sunlight arrives at a slant and spreads its energy over more ground. Near the equator, more direct rays concentrate energy in a smaller area.**
2	Why does the Northern Hemisphere receive more solar heating in July than in January?	**In July, Earth's tilt points the Northern Hemisphere toward the Sun, giving its middle and high latitudes longer days and more direct rays than in January.**
3	Why does sunlight near the equator change less across seasons than sunlight at higher latitudes?	**Near the equator, day length and the Sun's angle change less over the year, so sunlight stays fairly strong across seasons.**
4	How do Earth's curvature and tilt help explain warm summers and colder winters in many middle-latitude regions?	**Earth's curvature gives middle latitudes less concentrated sunlight than the equator. Earth's tilt changes their day length and the angle of incoming rays through the year, bringing more heating in summer and less in winter.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In July, the site at 15°S usually receives the most solar heating, and the site at 80°S receives the least. Earth's curved surface makes sunlight strike more directly and concentrate its energy over a smaller area at 15°S than at the higher latitudes. Because the Southern Hemisphere tilts away from the Sun in July, days are shorter there, and 80°S has no daylight. Over many years, this helps make low latitudes generally warmer and polar latitudes colder, although other factors also affect climate.

Accept explanations that connect latitude to the angle and spread of sunlight, and tilt to seasonal changes in daylight or sun angle. For Your Turn, students should identify 15°S as receiving the most July solar heating and 80°S as receiving the least.