

4.1 Climate

Lesson Objectives

-  Differentiate between weather and climate.
-  Identify the factors that influence climate.

Lesson Summary

Weather and Climate **Weather** is the condition of Earth’s atmosphere at a particular time and place. **Climate** is the average condition of temperature and precipitation in a region over long periods.

- ▶ Climate can vary over short distances.
- ▶ These variations produce **microclimates**.

Factors That Affect Climate Climate is affected by solar energy trapped in the biosphere, by latitude, and by the transport of heat by winds and ocean currents.

- ▶ Temperature on Earth stays within a range suitable for life due to the greenhouse effect. The **greenhouse effect** is the trapping of heat by gases in the atmosphere.
- ▶ Earth’s curvature causes different latitudes to receive less or more intense solar energy. The unequal distribution of the sun’s heat on Earth’s surface results in three main climate zones: polar, temperate, and tropical.
- ▶ Unequal heating of Earth’s surface also causes winds and ocean currents. Winds and currents move heat and moisture through the biosphere.

Weather and Climate

1. How is weather different from climate?

2. What causes microclimates to form?

3. In the Northern Hemisphere, why are the south-facing sides of buildings often warmer and drier than the north-facing sides?

Factors That Affect Climate

VISUAL ANALOGY For Questions 4–5, refer to the Visual Analogy comparing the Earth’s atmosphere to a greenhouse.



4. What is the source of radiation for both the Earth’s atmosphere and the greenhouse?

5. What happens to sunlight that hits Earth’s surface?

For Questions 6–9, write the letter of the correct answer on the line at the left.

_____ 6. What effect do carbon dioxide and methane have on Earth’s temperature?

- A. They trap heat in the atmosphere.
- B. They release heat from the atmosphere.
- C. They block heat from entering the ocean.
- D. They block heat from reaching Earth’s surface.

_____ 7. How would the temperature on Earth change without the greenhouse effect?

- A. The temperature at the equator would be warmer.
- B. The temperature would stay the same.
- C. It would be 30°C warmer.
- D. It would be 30°C cooler.

- _____ 8. What causes solar radiation to strike different parts of Earth’s surface at an angle that varies throughout the year?
- A. Earth’s tilted axis
 - B. Earth’s erratic orbit
 - C. the moon’s orbit around Earth
 - D. solar flares on the sun’s surface
- _____ 9. In which location is the sun almost directly overhead at noon all year?
- A. the equator
 - B. the South Pole
 - C. the North Pole
 - D. North America

10. Complete the table about Earth’s three main climate zones.

Main Climate Zones		
Climate Zone	Location	Climate Characteristics
	Areas around North and South poles	
	Between the polar zones and the tropics	
	Near the equator	

For Questions 11–14, write True if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

- _____ 11. Patterns of heating and cooling result in ocean currents.
- _____ 12. Warm air is less dense than cool air.
- _____ 13. Surface water moved by winds results in ocean currents.
- _____ 14. Deep ocean currents are caused by the sinking of warm water near the poles.

Apply the Big idea

15. Describe how a change in the temperature of an ocean current might affect the climate of a nearby coastal area.
