

Earth's Air Shield

How atmospheric gases and layers support life

SC.6.E.7.9 "Describe how the composition and structure of the atmosphere protects life and insulates the planet."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each sentence that explains how the atmosphere protects life. Circle each sentence that explains how gases or clouds affect Earth's temperature. A sentence may have both marks.

More Than Air

- ① Earth is wrapped in a mixture of gases called the atmosphere. Nitrogen makes up most of it, and oxygen is the gas people and many other organisms use for respiration. Smaller amounts of other gases have important jobs. High in the stratosphere, ozone absorbs much of the Sun's harmful ultraviolet radiation before it reaches living things. Without this ozone-rich region, extra ultraviolet radiation could damage skin, eyes, and the cells of plants and animals on Earth.
- ② The atmosphere also helps keep Earth warm enough for liquid water and life. After the ground and oceans absorb energy from sunlight, they release energy as infrared radiation. Water vapor, carbon dioxide, and methane absorb some of this outgoing infrared radiation and emit energy in all directions. This natural greenhouse effect slows the loss of heat to space. Clouds can reflect some incoming sunlight, but they can also trap some outgoing heat, so their overall effect can vary.
- ③ Atmospheric structure matters as well as composition. The lowest layer, the troposphere, contains most air and is where weather occurs. Above it, the stratosphere holds the ozone-rich region. Higher layers contain thinner gas, yet they still interact with material and energy from space. Many small meteoroids heat up and break apart as they collide with atmospheric gases, reducing the chance that they reach the ground. In the highest layers, gases absorb some high-energy radiation from the Sun.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Which region of the atmosphere absorbs much harmful ultraviolet radiation, and what can this radiation damage?

2 Describe how water vapor, carbon dioxide, and methane help slow the loss of heat from Earth.

3 How can clouds affect Earth's temperature in two different ways?

4 How do atmospheric gases reduce the chance that many small meteoroids reach the ground?

3 YOUR TURN _____ Your own words

A new planet has air, but no ozone-rich region and far fewer greenhouse gases than Earth. Write exactly three sentences predicting how these changes would affect living things and the planet's temperature.

PART 1 • READ AND MARK

Underline each sentence that explains how the atmosphere protects life. Circle each sentence that explains how gases or clouds affect Earth's temperature. A sentence may have both marks. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Which region of the atmosphere absorbs much harmful ultraviolet radiation, and what can this radiation damage?	The ozone-rich region in the stratosphere absorbs much ultraviolet radiation. Extra ultraviolet radiation can damage skin, eyes, and the cells of plants and animals.
2	Describe how water vapor, carbon dioxide, and methane help slow the loss of heat from Earth.	They absorb some outgoing infrared radiation and emit energy in all directions. This natural greenhouse effect slows heat loss to space.
3	How can clouds affect Earth's temperature in two different ways?	Clouds can reflect some incoming sunlight, which can reduce warming. They can also trap some outgoing heat.
4	How do atmospheric gases reduce the chance that many small meteoroids reach the ground?	Meteoroids collide with atmospheric gases, heat up, and break apart before reaching the ground.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Without an ozone-rich region, more harmful ultraviolet radiation would reach living things. With fewer greenhouse gases, less outgoing infrared radiation would be absorbed and emitted back toward the surface. The planet would lose heat to space faster and would probably be cooler, making conditions harder for many organisms.

Accept accurate descriptions using the terms ultraviolet radiation, infrared radiation, ozone, greenhouse gases, or clear equivalent language. For the open response, students should predict both increased ultraviolet exposure and faster heat loss that leads to cooler conditions.