

**FOCUS  
ON  
SCIENCE**

# Earth's Climatic Zones

Basic Level



Earth Science  
Weather

**FOCUS**curriculum

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## Scientific Inquiry

**The central purpose of scientific inquiry to develop explanations of natural phenomena in a continuing, creative process.**

Construct explanations independently for natural phenomena, especially by proposing preliminary visual models of phenomena.

Propose a model of a natural phenomenon.

Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.

**Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.**

Carry out their research proposals, recording observations and measurements (e.g., lab notes, audiotape, computer disk, videotape) to help assess the explanation.

Collect quantitative and qualitative data.

## Earth Science

**Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.**

Nearly all the atmosphere is confined to a thin shell surrounding Earth. The atmosphere is a mixture of gases, including nitrogen and oxygen with small amounts of water vapor, carbon dioxide, and other trace gases. The atmosphere is stratified into layers, each having distinct properties. Nearly all weather occurs in the lowest layer of the atmosphere.

The rock at Earth's surface forms a nearly continuous shell around Earth called the lithosphere.

The majority of the lithosphere is covered by a relatively thin layer of water called the hydrosphere.

Water circulates through the atmosphere, lithosphere, and hydrosphere in what is known as the water cycle.

**Human decisions and activities have had a profound impact on the physical and living environment.**

A population consists of all individuals of a species that are found together at a given place and time. Populations living in one place form a community. The community and the physical factors with which it interacts compose an ecosystem.

Given adequate resources and no disease or predators, populations (including humans) increase. Lack of resources, habitat destruction, and other factors such as predation and climate limit the growth of certain populations in the ecosystem.



Earth's  
Climatic  
Zones

## English Language Arts

The following is a selective listing of the competencies and indicators addressed in this book.

### Literacy Competencies

#### Word Recognition

- Recognize at sight a large body of high-frequency words and specialized-content vocabulary

#### Background Knowledge and Vocabulary Development

- Use word structure knowledge, such as roots (e.g., Greek and Latin), prefixes, and suffixes, to determine word meaning

#### Comprehension Strategies

- State or summarize a main idea and support it or elaborate on it with relevant details

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## How to Help Your Students Make the Best Use of This Book

Encourage students to develop nonfiction literacy skills by completing the Active Reader activities. Also encourage them to . . .

- Underline main ideas in paragraphs.
- Circle details that support the main ideas.
- Write down questions as they read.
- Circle key words as well as unfamiliar words.

## Printing Instructions

**Student Book:** print pages 5–34

**Assessments:** print pages 35–38

**Answer Key:** print pages 39–42

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# Earth's Climatic Zones

**How do matter and energy interact to produce weather patterns?**

It is monsoon season in India. Strong winds blow in from the sea. It rains three feet in one day. Forty feet of rain falls in four months. The land is flooded.

In India, monsoons last from June until September. They change the land. They change the way people and animals live. Can you think of other weather events that do this?



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## Build Background

### Use Your Knowledge

Some of the decisions you make every day are determined by the weather. Write a few sentences about how your life is affected by the weather.

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**Keep a Weather Journal** People have been recording weather conditions for a long time. In this activity you will keep a weather journal for a week. You will take notes about temperatures, precipitation (rain, sleet, snow), wind, and what the sky looks like. You will record observations made by others, too.

1. Answer the questions under “Predict” on page 9.
2. For one week, record your observations in the Weather Journal on page 10.
3. Record the temperature at the same time each day.
4. The wind is part of the weather, too. Take notes about the types of winds you observe. Is there no wind, soft breezes, or gusty winds? Do the winds change?
5. Look at the sky every day. Are there storm clouds? No clouds? Are the clouds puffy or flat, high or low, light or dark? Write a description or draw a picture of how the sky looks.
6. Talk to other people about the weather. Do they notice something about the weather that you did not notice?
7. Look at the effect the weather has on plants where you live. Did a rainstorm break tree branches? Did plants wilt under a hot sun? Note things such as these in the “Other Observations” column.
8. At the end of one week, answer the questions under “Conclusions” on page 9.





**Keep a Weather Journal** Answer the “Predict” questions below. Then use the Weather Journal on page 10 to record weather conditions for a week. At the end of the week, return to this page and answer the “Conclusions” questions.

## Predict

What kinds of weather do you expect to see? Why?

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What kinds of weather are typical for this season of the year where you live?

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## Conclusions

How would you describe the week’s weather in general?

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Was the weather typical for this season where you live? Explain.

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What effect did the weather have on the plants where you live?

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# Weather Journal

Day	Temperature	Precipitation	Wind	Sky	Other Observations
1					
2					
3					
4					
5					
6					
7					

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# Key Vocabulary

## Rate Your Knowledge

The words listed below have to do with weather and climate. Each word is important. Read each word. Then complete the chart by describing what you know about each word. After completing this book, come back to this page and write the definitions of words you did not know.

	I don't know it.	I've seen it and I think it means . . .	I know it well. It means . . .
biome			
atmosphere			
climate			
weather			
troposphere			
humidity			
precipitation			
saturated			
dew point			
infiltration			
temperate			
transpiration			



# Key Concepts

**Climate** is the typical weather an area has over many years. **Weather** is what’s happening outside on any given day. Weather can change from day to day. The climate of a region remains the same for a long time. Climate change does happen, but it takes many years.

Complete the following chart. Describe the general climate where you live. Also describe today’s weather.

Climate of the Region	Today’s Weather
Summer:	
Fall:	
Spring:	
Winter:	

## ACTIVE READER

**1 Research** Use the Internet to find the average high temperature in your community during January, April, July, and October.

Month	Average High Temperature
January	
April	
July	
October	

## Good to Know

Geologic time is the time scale that measures Earth’s natural history. Climate changes occur over geologic time. Earth’s history is marked by cold periods (such as the ice ages) and warm periods that are quite regular.

# Chapter 1 What Creates Weather?

## FOCUS

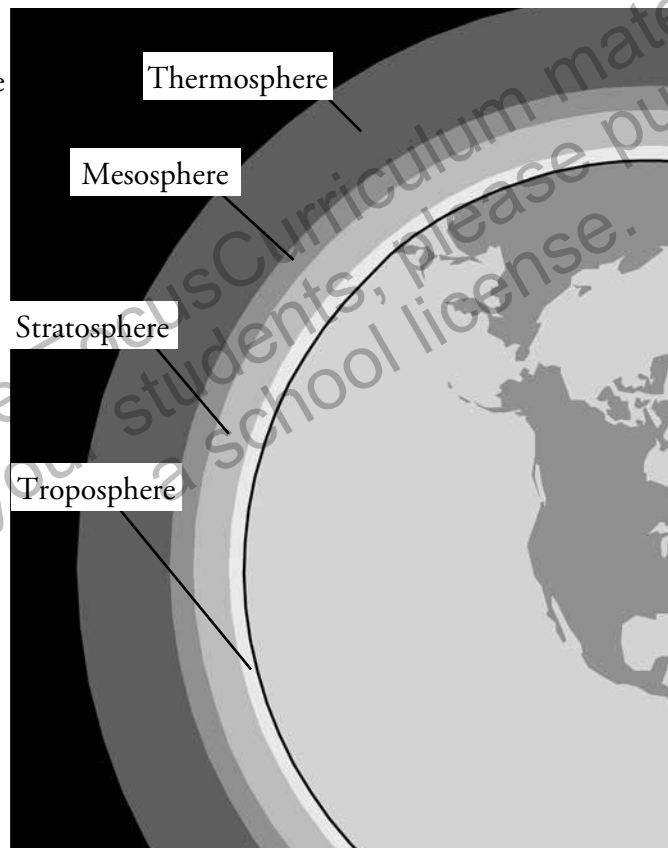
The underlined sentence defines what weather is and where it happens. As you read this section, find out about Earth's atmosphere and how it is connected to weather.

## Where Weather Happens

**Weather** happens every day. It affects the time it takes you to go places. For example, it can take longer to get to school when there's a snowstorm. Weather affects what you pay for things. Oranges cost more at the grocery store if cold weather destroys some of the crop.

So what is weather? Weather is what it's like outside at a certain place and time. Weather describes what is happening in the **atmosphere**. What is atmosphere? It is the layers of gas that surround Earth.

## Layers of Earth's Atmosphere



## ACTIVE READER

**1 Infer** If weather were defined as “the state of the atmosphere,” would the definition be accurate? Why or why not?

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**2 Identify** In the diagram, circle the names of the layers of the atmosphere. Which layer is closest to Earth's surface?

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## Web Quest

You might have heard weather sayings such as, “A wind from the south has rain in its mouth.” Or, “If the lark flies high, expect fair weather.” Use the Internet to make a list of other weather sayings. Then do research to find out if there's science behind the sayings.

The atmosphere is gas. It is mostly nitrogen, oxygen, and **water vapor**. Water vapor is important because it helps warm Earth. It also creates fresh water.

Most weather happens in the **troposphere**. This is the lowest part of the atmosphere. Why? Because most of the water vapor is found there.

**ACTIVE READER**

**1 Hypothesize** *The root sphere means “globe” or “ball.” The prefix meso- means “middle.” What does mesosphere mean, and why does it make sense as a name?*

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**Good to Know**

Every planet has a different atmosphere composed of different gases. For example, Saturn has a thick atmosphere composed of hydrogen and helium. No planets have an atmosphere similar to Earth’s. So if humans travel to other planets, they have to “bring their own atmosphere” to survive.

**FOCUS QUESTIONS**

1. **What is weather? Where in the atmosphere does it happen?**

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2. **Airplanes take off and fly up through the troposphere. They spend the majority of their flight time above it? Why do you think pilots do this?**

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**Investigate the Atmosphere** The pictures below show things that you'll find in different layers of the atmosphere. Do research to find out where each thing can be found. Then draw an arrow from each picture to the layer of the atmosphere where it belongs.

*jet* 

*cloud* 

*space shuttle* 

*meteorite* 

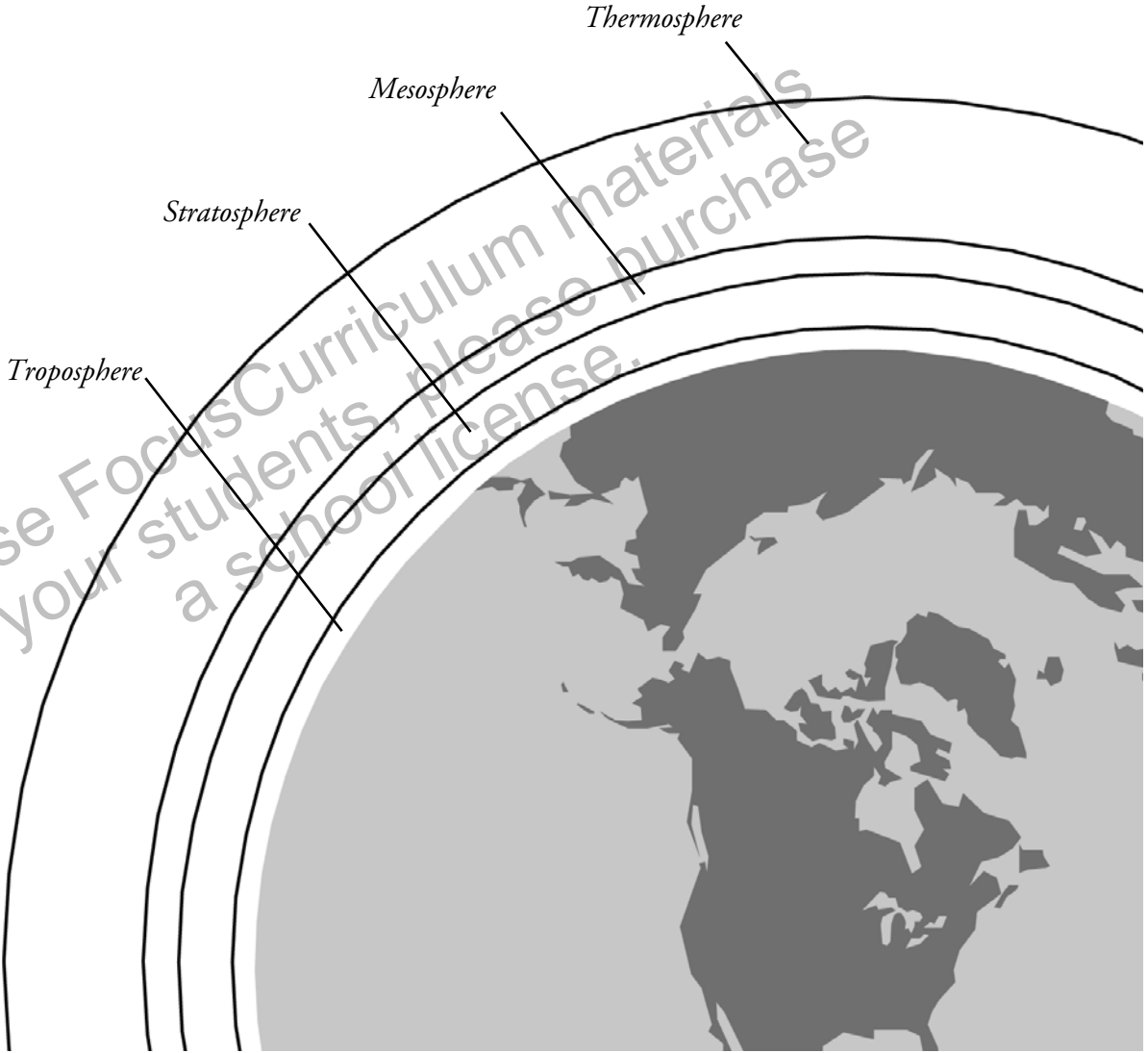
*International Space Station* 

*Troposphere*

*Stratosphere*

*Mesosphere*

*Thermosphere*



## FOCUS

Read to find out about the water cycle and how sunlight, water, and air temperature interact to cause weather.

## ACTIVE READER

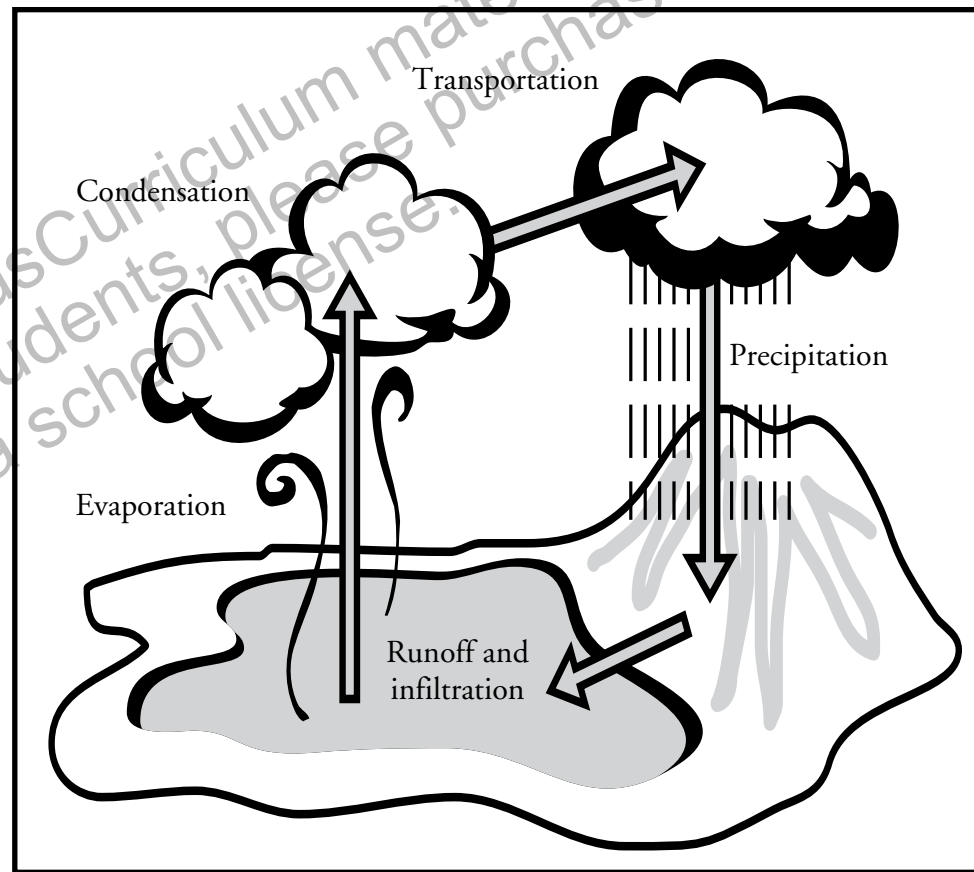
**1 Identify** Underline the sentence that tells the five parts of the water cycle.

## The Water Cycle

Water covers about 75% of Earth's surface. Water is stored in the oceans, seas, lakes, rivers, underground, on the surface, and in the atmosphere. All Earth's liquid water, frozen water, and water vapor in the crust and troposphere is called the **hydrosphere**. *Hydro* means "water."

Water moves from the surface of Earth into the troposphere and back. This happens again and again. For example, the water in your shower may have fallen as rain. When you are done with it, it may travel to the ocean. From there, it will travel back into the atmosphere. Finally, it will fall again as rain.

This process is called the water cycle. The five parts of the water cycle are **evaporation**, **condensation** and **transportation**, **precipitation**, **runoff** and **infiltration**.



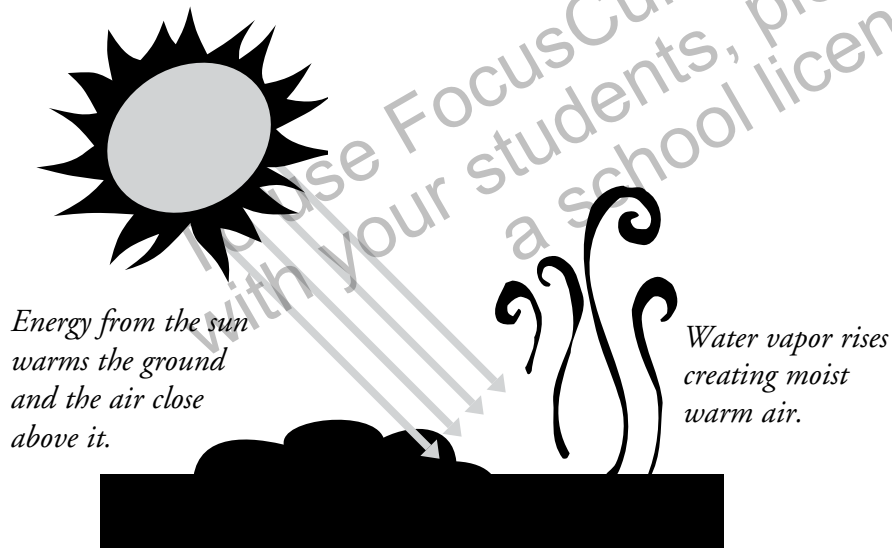


## How Evaporation Changes Water

During the water cycle, water changes form. Water can be a solid, a liquid, or a gas. The sun is like an engine that powers the water cycle. Energy from the sun travels through space. This energy warms Earth's surface. It warms the oceans and other bodies of water. As water heats up it escapes into the air in the form of a gas. This gas is called **water vapor**. This process is called evaporation.

During evaporation, water changes from liquid into gas. Almost all of the water vapor in the atmosphere evaporates from oceans, seas, lakes, and rivers. The rest comes from plants. They release water through their leaves in a process called **transpiration**.

**Humidity** is a measure of how much water vapor is in the air. Warm air can hold more water vapor than cold air. When air holds the most water vapor it can, we say it is **saturated**. What happens when the air is saturated? Condensation!



### ACTIVE READER

**1 Recall** *Where is most of the world's water at any one time?*

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**2 Monitor** *Underline the sentence that tells what evaporation does to liquid water.*

**3 Question** *A question I still have about evaporation is...*

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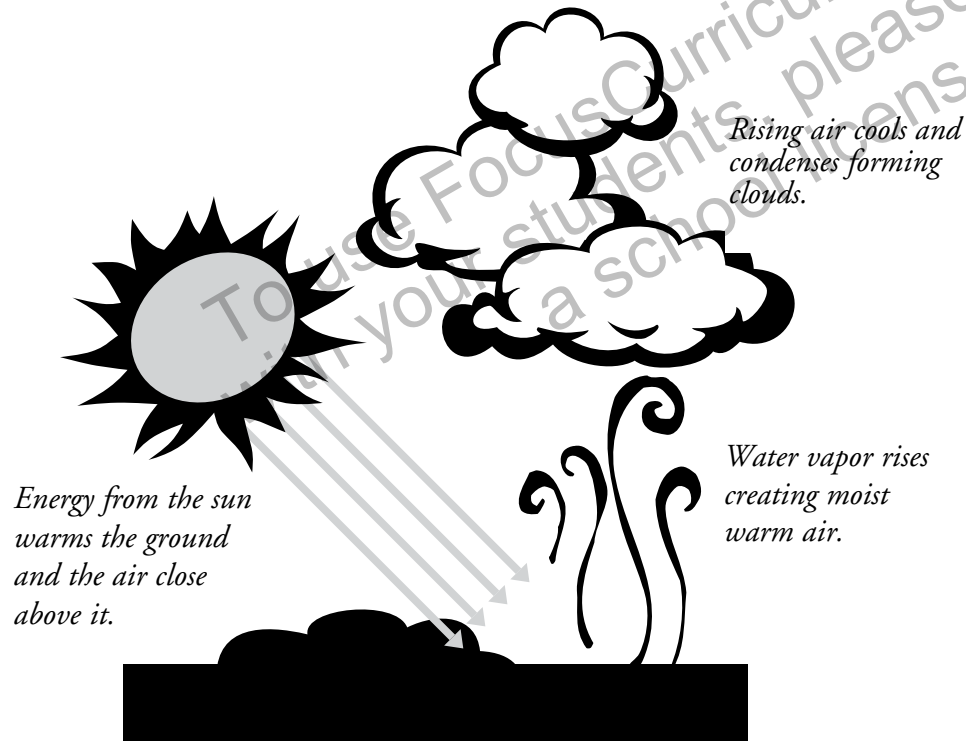
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## Condensation: the Opposite of Evaporation

What happens when you fill a glass with cold juice on a hot day? Drops of water form on the outside of the glass. These drops form when the warm air cools against the glass. This is how condensation works.

Cool air holds less water vapor than warm air. When the air cools below a certain temperature, called the **dew point**, water vapor changes into liquid water.

Condensation is how clouds form. Warm air rises and cools. Water vapor changes into tiny droplets. Ice crystals form if it's cold enough. They combine with tiny particles of dust. This forms cloud droplets. The cloud droplets come together to form clouds we can see. And it is from clouds that water returns to Earth's surface as rain or snow.



### ACTIVE READER

**1 Monitor** *Underline the sentence that defines condensation.*

**2 Connect** *What other real-life examples of condensation can you think of, besides water on the outside of a glass?*

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### Good to Know

The dew point can be thought of as the temperature at which dew forms. It's the point at which the air becomes saturated and water vapor turns to liquid. The dew point varies from place to place depending on two factors: air temperature and air pressure.

## Precipitation: What Goes up Must Come Down

Precipitation is rain, snow, hail, or sleet. As the droplets in a cloud combine, they get heavier. They fall through the atmosphere to Earth. It can take millions of cloud droplets to make one raindrop! If the dew point is below freezing, ice crystals form. These ice crystals may fall as snow.

## Runoff

What happens in the water cycle when rain, hail, and snow fall back to Earth? Some water flows over the surface of the ground and ends up in streams. Precipitation that flows along the ground is called **runoff**. For example, snow can remain on the surface for months. When the snow melts, it flows into streams as runoff.



*Snow that falls in the winter becomes runoff in the spring.*

### ACTIVE READER

**1 Compare** *What is the difference between precipitation and runoff?*

Precipitation is \_\_\_\_\_

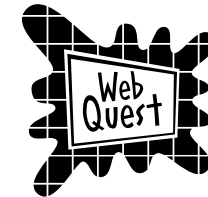
\_\_\_\_\_

\_\_\_\_\_

Runoff is \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Precipitation falls in different amounts throughout the world. Use the Internet to find the answers to these questions:

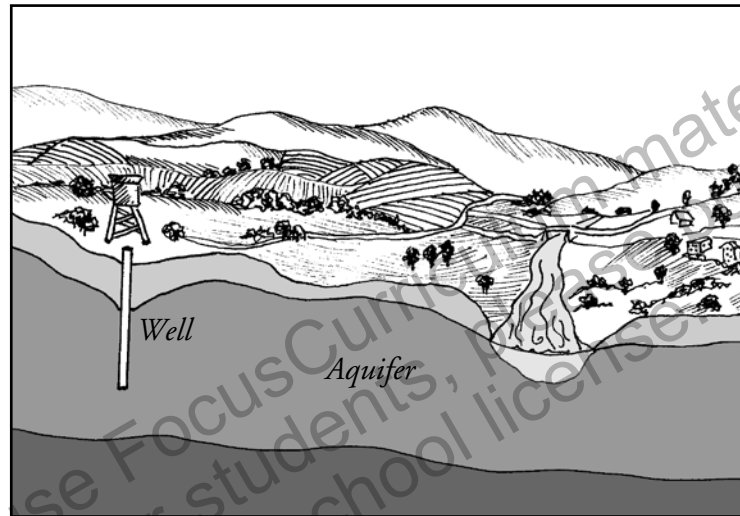
1. What place holds the world record for the highest average annual rainfall?
2. What place received no rain for 14 years?
3. What place holds the world record for most snowfall in one day?

## Infiltration and Groundwater

Water that is underground is called groundwater. It is an important part of the water cycle. Groundwater feeds streams and rivers. People use groundwater for drinking and farming.

How does groundwater get underground? Some of the water that falls goes down through the soil and rock. This is called infiltration. Water can sink far below the surface and collect in **aquifers**. Aquifers are huge storehouses of Earth's underground water.

Groundwater can be brought back to the surface through wells. Then it can evaporate and continue through the water cycle again and again.



### ACTIVE READER

**1 Identify** Circle the paragraph that tells why groundwater is important.

**2 Define** In your own words, define infiltration.

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### Good to Know

Some communities and regions construct “infiltration basins.” These are artificial, shallow depressions in the land that are designed to infiltrate storm water into the soil.

### FOCUS QUESTIONS

1. What is the water cycle?

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2. How do sunlight, water, and air temperature work together to cause precipitation?

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## Stop and Think

This page will help summarize what you have read so far. Use the tip to help you answer the questions.

### 1. Which of the following describes weather?

- (1) any activity that occurs in the troposphere
- (2) all the water that is stored in the hydrosphere
- (3) the state of the atmosphere at a certain place and time
- (4) the amount of precipitation that falls in summer and winter

### 2. Which sentence best describes the water cycle?

- (1) Water changes from a solid to a liquid to a gas.
- (2) Water is stored in rivers, lakes, seas, and in the air.
- (3) Water is stored in underground reservoirs called aquifers.
- (4) Water constantly moves from Earth to the atmosphere and back again.

### 3. How does water become part of the atmosphere?

- (1) Most water vapor occurs through condensation.
- (2) Most water vapor falls from clouds as precipitation.
- (3) Most water vapor evaporates from lakes, rivers, and oceans.
- (4) Most water vapor comes from plants as a result of transpiration.

### Tip:

To answer questions 1 and 2, skim the text and look for the headings *Where Weather Happens* and *The Water Cycle*. Reread that section to refresh your memory.

### Dear Ms. Understanding,

I'm confused. What's the difference between transpiration and evaporation?

*Confused in Cold Spring Harbor*



### Dear Confused,

Good question, and here's the answer: Transpiration is an "invisible" process that happens mostly inside plants.

First, moisture is carried through plants from their roots to small pores on the underside of leaves.

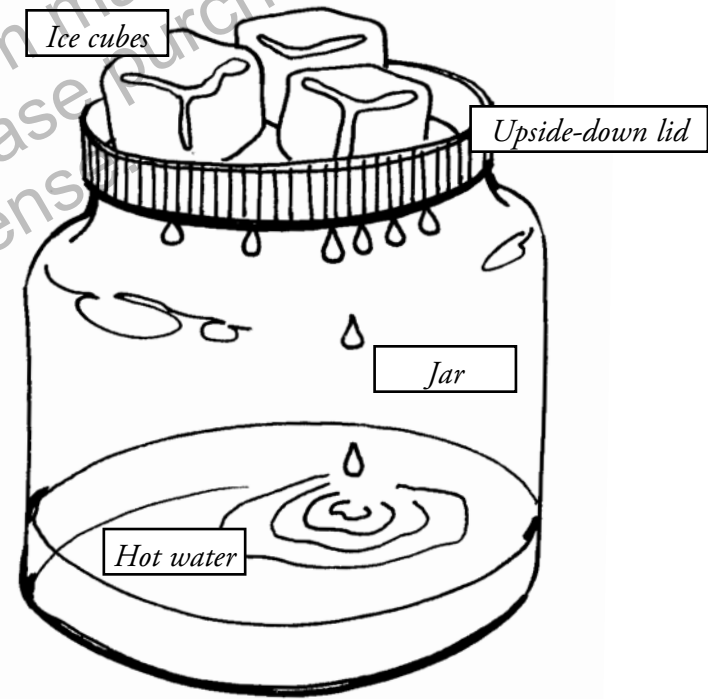
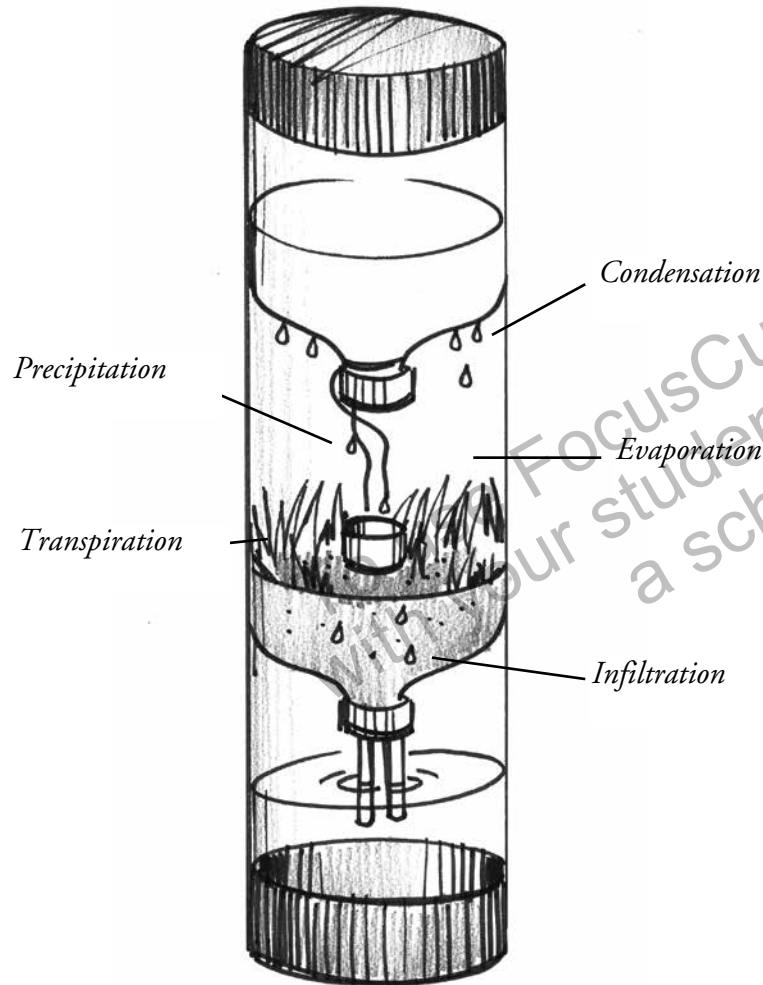
It's not until the moisture gets to the underside of leaves that it evaporates into the atmosphere.



*Ms. Understanding*



**Water Cycle Models** Make your own three-dimensional water cycle model. You can make a working model out of plastic bottles as seen in the first diagram below, or a simpler version using a glass jar with a lid as seen in the second diagram. Can you think of a different way to show the water cycle? Use your imagination!





# Chapter 1 How Does Climate Affect Earth?

## FOCUS

The underlined sentence states an important idea about how climate affects nearly everything about a place. Read this section to find out how climate shapes our world.

Weather can change from day to day. Climates remain similar from one year to the next. When people talk about climate, they talk about the general patterns of the seasons.

Why do we have deserts, rainforests, and grasslands? Why do cacti live in deserts, and sloths live in rainforests? The answer to these questions is climate. A region's climate helps determine what the land is like and what plants and animals live there.

A biome is the community of plants and animals that have adapted to the climate in a region. Land biomes include forests, grasslands, and deserts.

## Forest Biomes

About a third of the land on Earth is forest. The main plants in a forest biome are trees. There are several kinds of forests. Each has a different climate.

### Tropical Forest

The temperature in a tropical forest doesn't vary much over the year. This kind of forest has no real winter. It rains a lot. A huge variety of plants live in tropical forests.

*Tropical rainforests are wet and warm with a huge variety of plants.*



## ACTIVE READER

**1 Recall** Check three things that characterize a tropical forest.

\_\_\_\_\_ lots of rain

\_\_\_\_\_ steady temperatures

\_\_\_\_\_ long, dry winters

\_\_\_\_\_ many plant varieties

\_\_\_\_\_ few trees

## Good to Know

Tropical rainforests are located near the equator. They are shrinking, though. Over one-half of tropical rainforests have been destroyed by logging, farming, development, and other human activities. Individuals and organizations are working to preserve the rainforests and their countless plant and animal species.

## Temperate Forest

**Temperate** forests have four seasons. Winter can get quite cold. You can find a wide range of trees in a temperate forest. Trees such as maple, oak, and willow lose their leaves in winter. Pine trees remain green through the winter. Many plant and animal species live in temperate forests. Many foods, such as maple sugar, mushrooms, walnuts, and apples come from these forests.

## Boreal Forest

The climate in boreal forests, or taiga, is very cold. Boreal forests have long, dry winters and short, moist summers. These forests are found in northern areas.

Pine, fir, and spruce trees grow here. They have needle-like leaves, which help them survive the cold. Water does not evaporate as quickly in these types of leaves.

### FOCUS QUESTIONS

1. How does climate shape a place?

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2. Name one way in which tropical, temperate, and boreal forests are different from each other. Explain the difference.

Tropical	Temperate	Boreal

### ACTIVE READER

**1 Recall** How are temperate forests like tropical forests?

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**2 Hypothesize** Do you think that boreal forests have a long or a short growing season? Explain your answer.

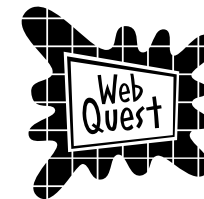
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Boreal forests are the largest land biome. Use the Internet to find a map showing where in the world boreal forests are.



**FOCUS**

The next part of this chapter tells about grassland biomes. Read to find out about two types of grassland biomes and what makes them different from each other.

**Grassland Biomes**

The grassland biome is mostly grasses instead of trees or large shrubs. There are two main types of grasslands: **savannas** and temperate grasslands.

**Savanna**

Savannas are grasslands that cover huge areas of Africa, Australia, South America, and India. The temperature is warm or hot. Rain falls during six or eight months of the year. Then a long drought follows.

During this drought, fires burn back the dry grass. The deep roots are unharmed. When the rainy season returns, the grasses grow quickly. This provides food for many kinds of animals.



*Savannas cover huge areas of Africa, Australia, South America, and India.*



*Elephants live on the African savanna.*

**ACTIVE READER**

**1 Recall** *What makes a grassland biome different from a forest biome?*

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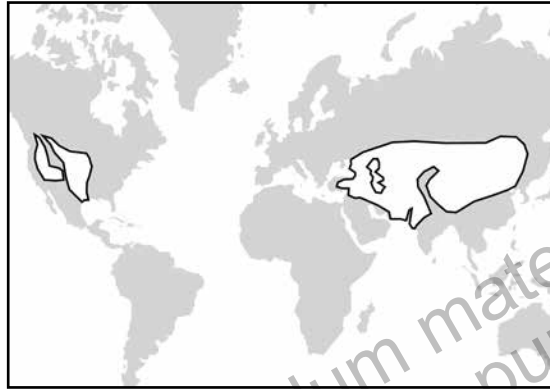
**Good to Know**

Did you know that elephants can create savannas? It happens when there are a large number of elephants in a woodland. They eat the leaves and twigs off trees and break off their branches. Then they smash the trunks and strip off the bark. Soon a woodland is a savanna!

## Temperate Grassland

Temperate grasslands are like savannas. They have a rainy season followed by drought. The temperature varies much more than in savannas, though. There is less precipitation in temperate grasslands. The North American plains and prairies are examples of temperate grasslands.

Temperate grasslands have deeper, darker, richer soils. They are good for growing things. Many temperate grasslands are now farming and grazing lands.



*Temperate grasslands are found in North America and Asia*

### ACTIVE READER

**1 Connect** *You have learned about temperate forests and temperate grasslands. What do you think temperate means? Check your answer with a dictionary definition.*

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**2 Research** *Temperate grasslands can be divided into smaller groups. Research and list the names of two types of temperate grasslands.*

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### FOCUS

### QUESTIONS

1. How are savannas and temperate grasslands alike?

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2. How are savannas and temperate grasslands different from each other?

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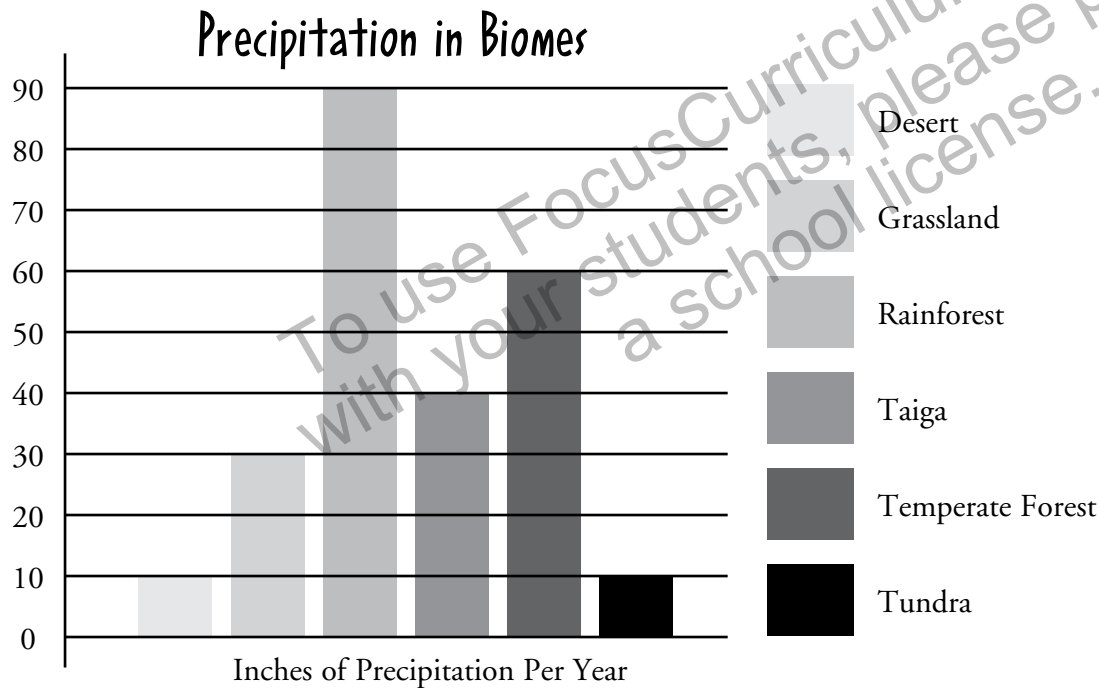


This part of the chapter tells about two biomes that have little precipitation. As you read, find out how climate has shaped these biomes.

### Desert Biomes

Death Valley. Great Sandy. The Sahara. When you read these words, you think about hot sands. You think about the desert.

About one fifth of Earth's surface is desert. Deserts are very dry. Most get less than 10 inches of precipitation a year. This chart compares the precipitation of deserts with other biomes.



### ACTIVE READER

**1 Identify** Underline the sentence that tells how much precipitation most deserts get each year.

**2 Analyze** Use the *Precipitation in Biomes* chart to answer these questions:

a. Which biome gets the most precipitation?

b. Which biomes get the least precipitation?

**3 Extend** What effects do you think differing amounts of precipitation have in a biome?

We usually think of deserts as hot. But some get cold. There are four kinds of desert biomes.

## Hot and Dry Desert

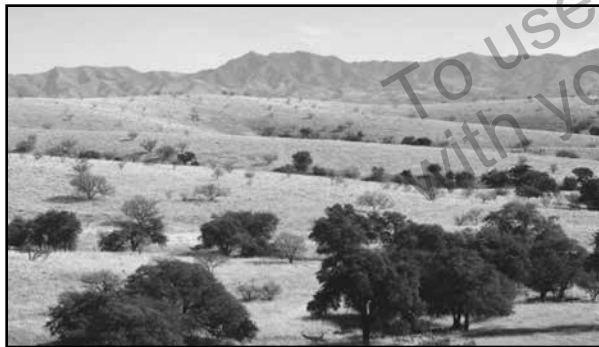
Why are deserts hot and dry? Moisture in the air blocks the sun's rays. But there is very little moisture in the desert air. So, deserts receive more heat during the day than other areas. They also lose almost twice as much heat at night.

Plants that live in these deserts are usually short. They have small, thick leaves or spines. Why? These help them conserve water. Many desert animals stay quiet during the hot day. They come out at dawn, dusk, and night to look for food.

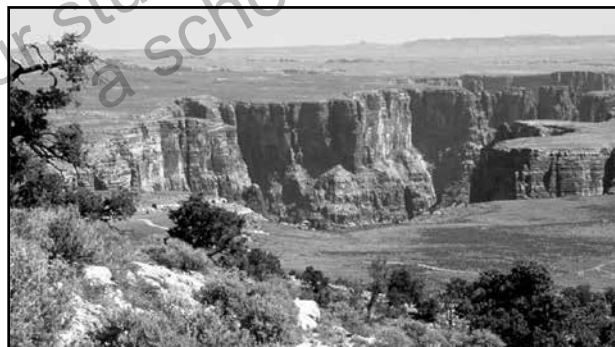
## Semiarid Desert

Semiarid deserts have long, dry summers. Cool nights help water condense as dew. Some semiarid deserts receive more dew than rain!

Spines, thorns, and hairs help the plants here conserve water. Some plants have shiny, silvery leaves. These help them reflect the sun's energy. Animals that live here may live underground. Some even follow the moving shadows of plants to stay cool!



*Plants that live in a hot, dry desert are usually short with thick leaves or spines.*



*Semiarid deserts have long, dry summers*

**Dear Ms. Understanding,**

I'm worried about something I heard about called desertification. Why do the deserts keep growing and growing? Will they take over the world?



*Dreads Death Valley*

**Dear Dreads,**

You're right to worry about desertification, and a lot of desertification does take place in arid and semiarid lands. But it is a common misunderstanding that desertification spreads from a desert core. Desertification happens when dry lands expand because of poor agricultural practices such as overcultivation, overgrazing, and cutting down forests for fuels. It can even happen far from deserts!



*Ms. Understanding*

## Coastal Desert

Coastal deserts have long, warm summers. The plants in coastal deserts have shallow roots. This helps them get what little rain falls. Their stems and leaves can store water for use during dry times.

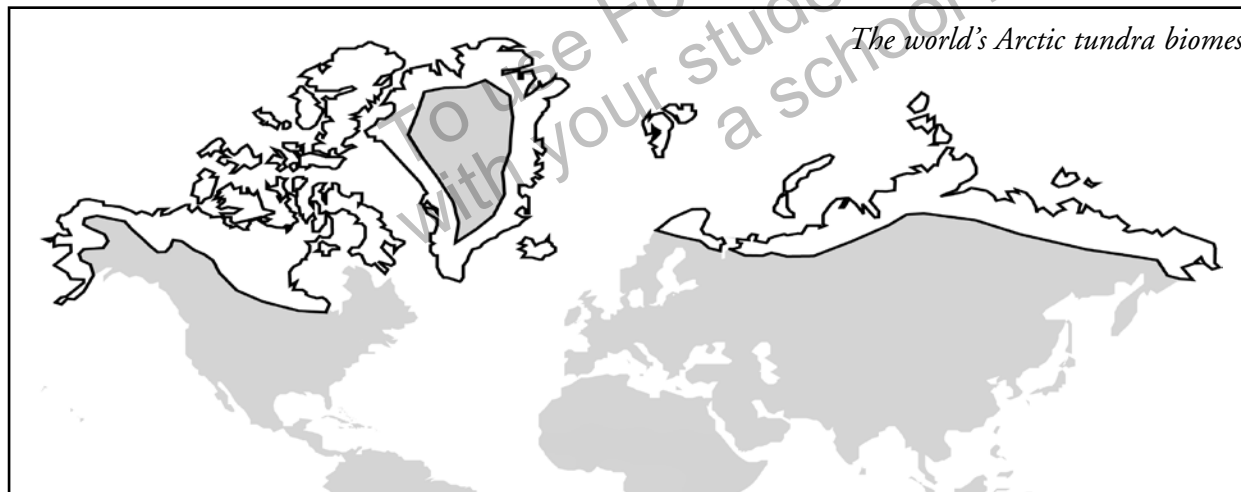
## Cold Desert

This kind of desert might not seem like a desert to many people. The winters are cold with rain and snow. Most plants have spiny leaves, which they lose in the winter. These plants are scattered over the desert.

## Tundra Biomes

The coldest biome in the world is the tundra. The Arctic tundra circles the North Pole. Snow and ice cover the ground. Even the sea sometimes freezes.

The Arctic tundra has a layer of permanently frozen soil called permafrost. Winters are very long. Summers are short. Plants in the Arctic tundra have shallow roots. They grow in tight groups to survive the extreme cold. They include low shrubs, mosses, grasses, flowers, and lichen.



## ACTIVE READER

**1 Recall** Write *coastal* beside the details that describe coastal deserts. Write *cold* beside the details that describe cold deserts. Write *tundra* beside the details that describe tundras.

*permafrost* \_\_\_\_\_

*46 cm precipitation* \_\_\_\_\_

*coldest biome* \_\_\_\_\_

*long, warm summers* \_\_\_\_\_

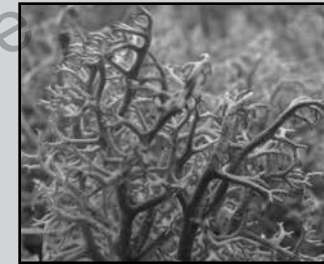
## Good to Know

- Tundra means “treeless plain” (it comes from the Finnish word *tunturi*).
- One tree grows in the tundra: the dwarf willow. It is 10 cm (4 inches) tall!
- In the tundra during the summer, the sun shines all the time, even at midnight.
- The tundra has “white outs” that last for days. Winds blow the snow so much that you can’t see!

The second type of tundra is Alpine tundra. This biome is found on mountains around the world. Alpine tundra is so high that trees can't grow. The climate is extremely harsh. In some places snowfields are permanent. Even so, the Alpine tundra has a longer growing season than the Arctic tundra. The plants that grow in the Alpine tundra are similar to those that grow in the Arctic tundra.

### Good to Know

Lichens flourish in harsh environments such as the tundra. Lichens do not need much water and can even grow on rocks.



Reindeer moss, pictured above, was so named because it provides food for reindeer in the tundra. Reindeer moss is actually a lichen.

### FOCUS QUESTIONS

1. What role does climate play in the development of the desert and tundra biomes?

---



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2. How are desert and tundra biomes alike?

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### CONCLUSION

In this book you have learned about the many ways in which weather and climate affect our planet—from the weather you experience every day to the plants that grow in a region. You've learned what causes the weather and how temperature and precipitation determine what a biome is like. On the lines below, write any questions you still have about Earth's Climatic Zones. Use Internet resources to find the answers.

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**Investigate Your Biome** Do research to complete the chart below with information about where you live. Then use the information in Chapter 2 to identify your biome.

Climate
Seasonal Variation: _____
Average Temperatures During Each Season: _____
Precipitation During Each Season: _____
Type of Soil
Plant Life
Animal Life
Biome Name

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Stop and Think

This page will help summarize what you have read so far. Use the tip to help you answer the questions.

1. Which definition correctly describes a biome?

- (1) the animals in a geographic region
- (2) weather that affects both plants and animals
- (3) plants that live in a temperate environment
- (4) living things that have adapted to a region's climate

2. What are the two main factors that help to determine what lives in a biome?

- (1) wind and humidity
- (2) the equator and the poles
- (3) evaporation and transportation
- (4) precipitation and temperature

Base your answers to questions 3 and 4 on the information below and on your knowledge of science.

Savannas and temperate grasslands are both examples of grassland biomes.

3. Explain how these two biomes are alike and different.

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4. Describe the climate in each type of biome.

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**Tip:**  
To help you answer question 1, look back at the second paragraph of Chapter 1 and find the definition of biome. Then find the answer that matches.

Dear Ms. Understanding,

Why does it seem hotter in humid places than it does in places that are just as hot, but drier?



*Sweating in Spring Valley*

Dear Sweating,

The human body regulates its temperature in part by sweating. When it's humid, sweat does not evaporate as well because the air itself is full of moisture. As a result, you feel hotter.



*Ms. Understanding*



# Glossary

**aquifers** – underground layers of rock, soil, gravel, or sand that hold enough fresh water to supply wells and springs

**arid** – lacking sufficient water or rainfall

**atmosphere** – the mass of air that surrounds Earth

**biomes** – geographical areas characterized by their climate and living organisms

**climate** – the average condition of weather over a period of years

**condensation** – the process by which water vapor turns into liquid water

**desert** – a biome with little precipitation and usually sparse vegetation

**dew point** – the temperature at which vapor begins to condense

**evaporation** – the process by which water changes from a liquid into a gas

**humidity** – a measure of water in the air

**hydrosphere** – all the water of Earth, including the water vapor in the atmosphere

**infiltration** – a process in which water on the ground filters down through rock and soil

**precipitation** – rain, sleet, snow, hail, and other forms of water that fall from the sky

**relative humidity** – the percentage of water vapor in the air compared with the amount of water vapor the air can hold when it is saturated

**runoff** – precipitation that is not absorbed and flows across the land

**saturated** – full of moisture; unable to hold any more water vapor

**savannas** – grasslands sparsely dotted with trees

**temperate** – having a climate that lacks extremes

**transpiration** – the process by which plants release water into the atmosphere

**troposphere** – the lowest part of the atmosphere, in which most weather occurs

water vapor – water in its gas form

**weather** – the state of the atmosphere at a certain place and time

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**FOCUS  
ON  
SCIENCE**

# Earth's Climatic Zones

Assessments

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# Check Understanding



In the Answer Document on this page, mark your answer in the row of circles for each question by filling in the circle that has the same number as the answer you have chosen.

1. An airline pilot climbs to a higher altitude to get above the building rain clouds.

The pilot is most likely traveling between which two atmospheric layers?

- (1) mesosphere and stratosphere
- (2) troposphere and stratosphere
- (3) thermosphere and mesosphere
- (4) stratosphere and thermosphere

2. Which biome is characterized by a very cold climate with about 40–100 cm of snow each year?

- (1) tundra
- (2) cold desert
- (3) boreal forest
- (4) temperate grassland

3. Which contains all of Earth's water?

- (1) troposphere
- (2) hydrosphere
- (3) lithosphere
- (4) atmosphere

4. A student walking to school splashes through puddles left on the sidewalk by last night's precipitation. It's still cold, but the sun is out and the weather forecast says it will be a warm day.

Which part of the water cycle describes what will happen to the puddle next?

- (1) runoff
- (2) infiltration
- (3) evaporation
- (4) transpiration

## Answer Document

- |    |   |   |   |   |    |   |   |   |   |
|----|---|---|---|---|----|---|---|---|---|
| 1. | ① | ② | ③ | ④ | 3. | ① | ② | ③ | ④ |
| 2. | ① | ② | ③ | ④ | 4. | ① | ② | ③ | ④ |

# Check Understanding



Base your answers to questions 5 and 6 on the information below and on your knowledge of science.

Students in one school have asked others from around the state to observe the weather every day and record data for a science project. The students plan to compare the data and look for statewide weather patterns. The chart below shows the data one student collected on a particular day. However, some important information is missing. Answer parts A and B about the chart.

Temperature	Precipitation	Wind Speed
33°F	sleet	10 mph
30°F		8 mph
27°F	light snow	

5. Identify one example of information that should have been included in the chart.
- 
- 
6. Explain how the incomplete data will make it difficult for students to make comparisons and look for weather patterns.
- 
- 
- 

Base your answers to questions 7 and 8 on the photograph below and on your knowledge of science.



7. What biome is shown in the photograph?
- 
- 
8. What is the climate of the biome like? Include information about temperatures and precipitation.
- 
- 
-

**FOCUS  
ON  
SCIENCE**

# Earth's Climatic Zones

Answer Key

# Answer Key

## Page 8: Starting Points

### Build Background

**Use Your Knowledge:** Answers will vary.

Think Like a Scientist: Keep a Weather

Journal: Answers will vary.

## Page 11: Starting Points

### Key Vocabulary

**Rate Your Knowledge:** Answers will vary.

Use Roots to Unlock Meaning:

1. troposphere and atmosphere;

The troposphere is a layer of Earth's atmosphere, which surrounds Earth, a globe. 2. thermometer

## Page 12: Starting Points

### Key Concepts

**Active Reader:** 1. Answers will vary.

## Page 13: Chapter 1

**Active Reader:** 1. No, because weather is dependent on the place and time.

2. troposphere

## Page 14: Chapter 1

**Active Reader:** 1. Mesosphere means "middle globe." It makes sense because it is one of the middle layers of the atmosphere.

**Focus Questions:** 1. Weather is the state of the atmosphere at a certain time and place. Most weather takes place in the troposphere, which is the lowest part of the atmosphere.

2. They avoid bad weather by going past the troposphere, where most weather occurs.

## Page 15: Chapter 1

**Hands On Science:** Investigate the Atmosphere: jet – stratosphere; cloud – troposphere; space shuttle – thermosphere; meteorite – mesosphere; International Space Station – thermosphere

## Page 16: Chapter 1

**Active Reader:** 1. Because all the water that exists today also existed when dinosaurs roamed Earth.

## Page 17: Chapter 1

**Active Reader:** 1. Most of the water is in storage. 2. Underline: During evaporation, water changes from liquid into gas. 3. Questions will vary.

## Page 18: Chapter 1

**Active Reader:** 1. Underline: Condensation is the process by which water vapor changes into liquid water. 2. Sample answer: Water that collects on the mirror after a hot shower

## Page 19: Chapter 1

**Active Reader:** 1. Precipitation is all water that comes from clouds; Runoff is precipitation that flows along the ground.

## Page 20: Chapter 1

**Active Reader:** 1. Circle: Even though you can't see it, there are vast amounts of water underground. Water that is stored beneath Earth's surface is called groundwater, and it is an important part of the water cycle. It feeds streams, rivers, and wetland habitats. People use groundwater for drinking and irrigation. To reach it, they dig wells.

2. Infiltration occurs when water flows down between rocks and soil into Earth.

**Focus Questions:** 1. The water cycle describes how the water on Earth travels from the atmosphere to the ground again and again. 2. The sun heats the air, which rises and cools. The cooler air becomes saturated with water vapor. When the air temperature drops below dew point, the water vapor changes into water droplets.

## Page 21: Chapter 1

**Stop and Think:** 1. (3); 2. (4); 3. (3)



# Answer Key

## Page 23: Chapter 2

**Active Reader:** 1. A biome describes all the life that lives in a certain geographic region. 2. stable temperature, more than 200 cm of rain, variety of plants

## Page 24: Chapter 2

**Active Reader:** 1. They can be divided into smaller groups by amount and timing of rainfall. 2. Answers will vary.

**Focus Questions:** 1. Climate influences what the land is like and the kinds of plants and animals that live there. 2. Tropical forests have a similar temperature year-round while temperate forests experience a wide range of temperatures and boreal forests have one long winter and a very short summer.

## Page 25: Chapter 2

**Active Reader:** 1. A grassland biome has mainly grasses instead of trees, like a forest biome.

## Page 26: Chapter 2

**Active Reader:** 1. Temperate means, “neither very hot or very cold.” 2. tall-grass and short-grass

**Focus Questions:** 1. Savannas and temperate grasslands have a rainy season and then a drought. 2. The temperature in temperate grasslands varies more than it does in savannas. Summers can be very hot while winters can be very cold.

## Page 27: Chapter 2

**Active Reader:** 1. Underline: Deserts are usually very dry—most of them get less than 25 cm (10 inches) of precipitation a year. 2. a. Rainforest; b. tundra and desert; 3. Answers will vary.

## Page 29: Chapter 2

**Active Reader:** 1. tundra, cold, tundra, coastal

## Page 30: Chapter 2

**Focus Questions:** 1. The lack of precipitation causes most deserts to be very dry. The low temperatures cause the tundra to have very short summers and long, cold winters. The climate determines what plants and animals can survive in these biomes. 2. Both biomes are characterized by harsh conditions where it is difficult to live.

## Page 31: Chapter 2

**Think Like a Scientist: Investigate Your Biome:** Answers will vary depending on where the student lives.

## Page 32: Chapter 2

**Stop and Think:** 1. (4); 2. (4); 3. Savannas and temperate grasslands are alike because both have a rainy season and then a drought. They are different because temperate grasslands have a greater variation in temperature.; 4. Savannas are grasslands with a few trees. They experience warm or hot temperatures, have a rainy season, and a drought. Temperate

grasslands have both hot and cold temperatures, a rainy season and a drought. They have rich soil that is good for farming.

## Page 37: Check Understanding

1. (2); 2. (3); 3. (2); 4. (3)

## Page 38: Check Understanding

5. The precipitation should have been measured when the temperature was 30° F and the wind speed was 8 mph.; 6. Accurate data is needed in order to identify patterns. The students cannot draw accurate comparisons between temperature, precipitation and wind speed as it is.; 7. Tropical forest; 8. Tropical forests have a similar temperature throughout the year. They receive at least 200 cm of rain per year. The plant life is diverse.

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