



Earth Science

Interactions of Air, Water, and Land

Basic Level

Fast Earth- Changing Processes

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Core Curriculum
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Reading Activities

Fast Earth-Changing Processes

How do natural events affect our world?

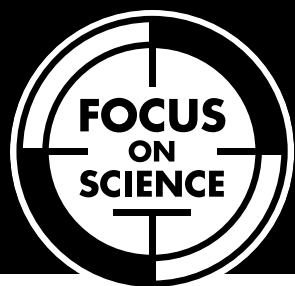
CORE CURRICULUM STATEMENTS

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

Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things.

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Fast Earth-Changing Processes BL

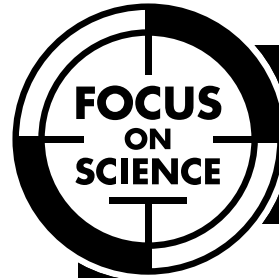
How do natural events
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Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

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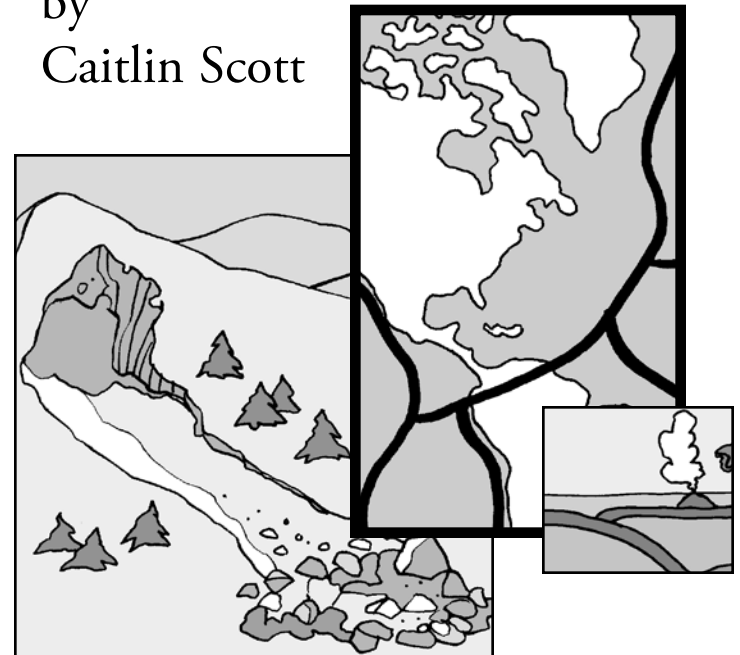


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Fast Earth-Changing Processes

by
Caitlin Scott





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Curriculum materials for **your** content standards

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*– Predict –
What do you think you will
learn from reading this book?*

INTRODUCTION

Earth Is Changing

Earth is always changing. Most changes happen slowly. On sandy beaches, the wind blows sand into large piles called sand dunes. Rivers slowly wash dirt and small rocks downstream to the ocean.

Earth changes quickly, too. These fast changes are very **dramatic**. They can harm plants and animals. They can put people in danger, too. Some of these fast changes are:

- earthquakes
- volcanoes
- tsunamis
- landslides
- avalanches
- forest fires

dramatic: very noticeable

Why do these changes happen? When will they happen? What can we do to stay safe?

Scientists answer these questions by studying Earth. They observe small changes. Then, they can predict large changes such as earthquakes. These scientists are called geologists.

There are about 28,000 geologists in the United States. Would you like a **career** studying changes on Earth? If so, be sure to study science and math in school.

– Conclude –

*Why are geologists important?
Talk about it with a friend.*

career: the work or a series of jobs a person has

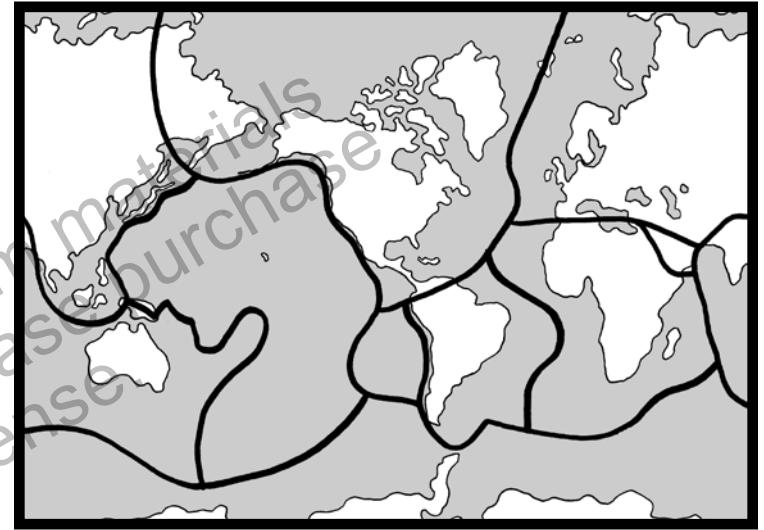
Shifting Plates

Look at a map of Earth. You might notice the land is like a puzzle. South America and Africa could fit together. That's because long ago, they once did.

Earth is made of layers. The crust is the layer we walk on. It breaks easily. The mantle is below the crust. It is softer, like a thick liquid. The crust floats on the mantle in big pieces called plates. Look at the map on the next page to see where these plates are located.

About 300 million years ago, heat inside Earth began pushing the plates apart. That is why South America and Africa are now apart.

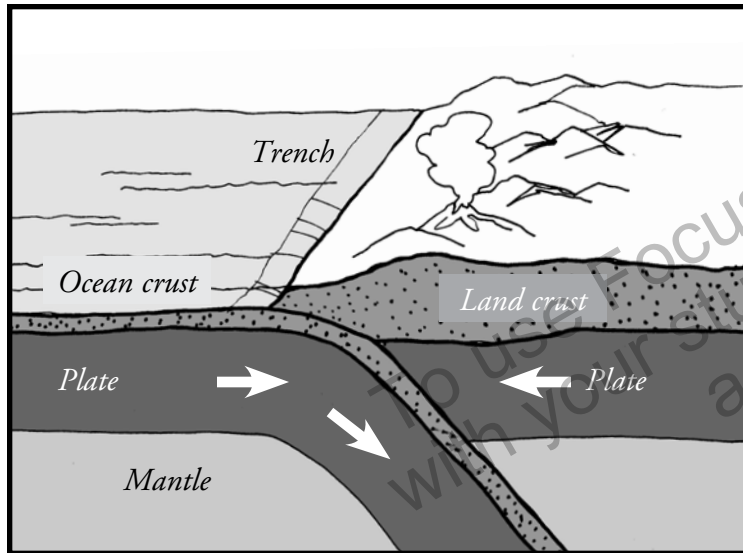
Earth's Major Plates



The dark lines on this map show the edges of Earth's major plates. Plates are large pieces of Earth's crust that are always moving.

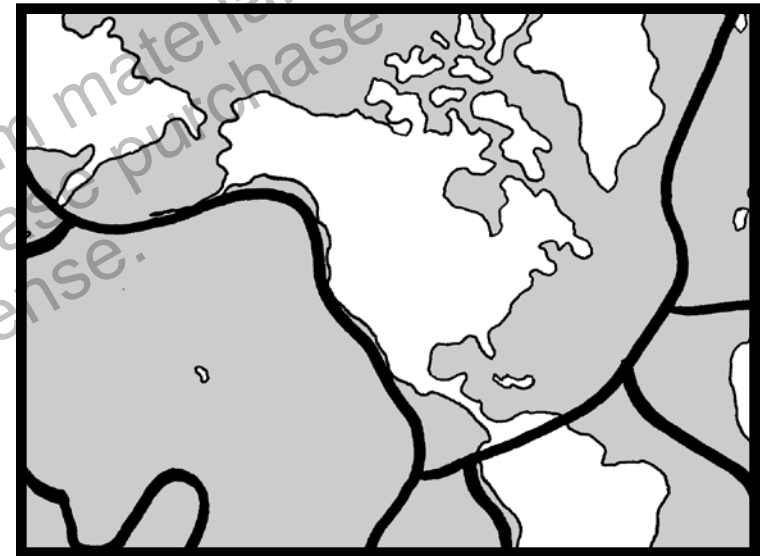
Earthquakes

Most of the time, plates move very slowly. But, sometimes two plates get stuck together. Pressure builds up. Then, the plates move suddenly—one under the other. This causes an earthquake.



Along fault lines, one plate moves under another. This causes earthquakes.

California has many earthquakes. Look at the dark line down the west coast of the United States on this map. This is a fault line. A fault line is where two plates meet. Many earthquakes happen on fault lines.

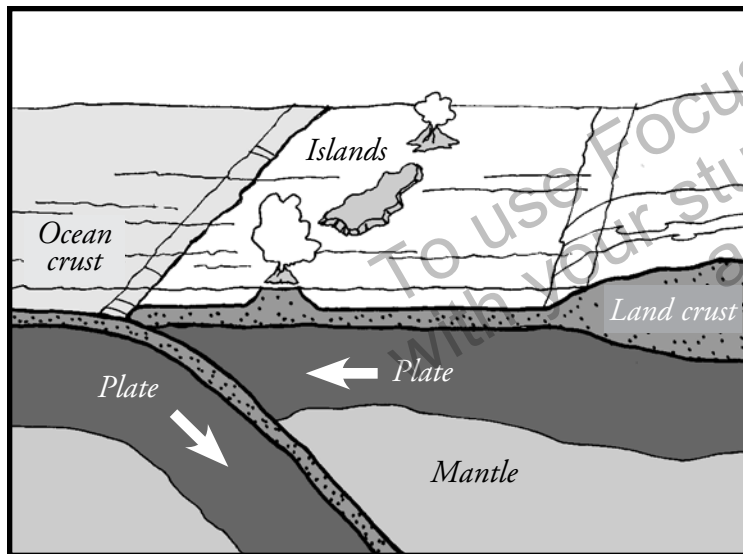


How can you stay safe in an earthquake?

- Drop to the ground.
- Take cover by getting under something heavy like a desk or a doorway.
- Hold on and wait for the ground to stop shaking.

Volcanoes

Volcanoes also happen along fault lines. Look at the picture below. One plate is moving under another. The two plates rubbing together create heat. This heat melts some of the rock. If the melted rock is pushed toward the crust, a volcano forms. This can happen on land or under the ocean.



Volcanoes under the ocean can erupt under water. When this happens, islands form. This is how the Hawaiian Islands were formed.

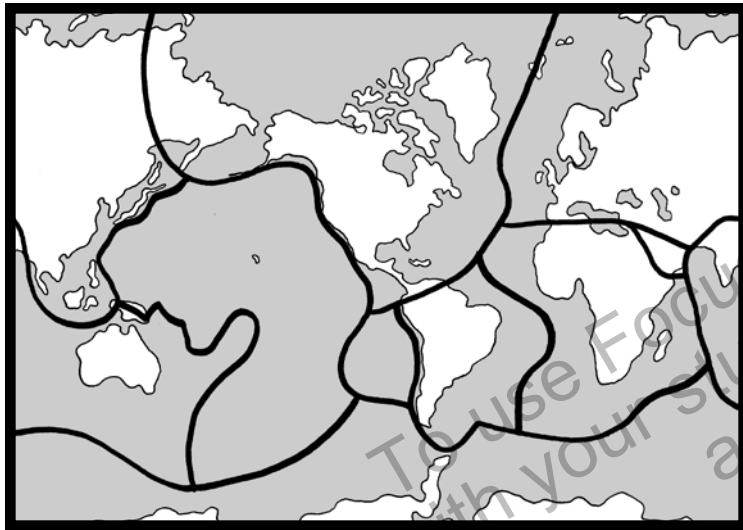
Volcanoes are dangerous. The ground shakes when they **erupt**. Hot rocks, **lava**, ash, and mud fly up in the air. The trees and buildings can be knocked down.

Most of the time, scientists can predict when a volcano will erupt. People usually have time to get away.

erupt: to explode with great force
lava: molten rock that flows or bursts from a volcano

Tsunamis

Look at the map of Earth's major plates again. It shows many fault lines under the oceans. What happens when there is an earthquake near a fault line underwater? It can be deadly!



When you throw a rock in water, it makes ripples. They move out in a circle. The same thing happens in an underwater earthquake. But, ripples from earthquakes are huge waves. They can be 100 feet tall. They can go more than 400 miles per hour.

Tsunamis are dangerous. The big waves tip over boats and knock down buildings. The flood waters cause problems, too.

There are warning centers in Hawaii and Alaska. Scientists usually know when a big wave is coming. People can do some simple things to stay safe.

First, listen to the news. It will tell you if a big wave is coming. Next, if a wave is on the way, get to higher ground. You should have a plan for escape. Finally, do not go back to the ocean after the first big wave. There is usually more than one large wave.

Gravity

Most of the time, gravity causes slow changes. It makes rocks fall from a mountain. It moves dirt and sand downhill. Gravity can also cause quick changes sometimes.

Landslides

Landslides make mud, dirt, and rocks slide downhill. Large landslides can bury people, buildings, and roads.

Landslides often follow an earthquake or flood. People can also cause landslides. Sometimes digging on a hill causes one.

Can you stay safe during landslides? Yes. The first thing to do is avoid them. Stay away from hills during floods and earthquakes.

Second, notice if the land is shifting. Do trees seem to be leaning over? If so, a landslide might occur. If you are in a landslide, try to get away. If you can't, get under something heavy like a table.

After the landslide, be careful. Do not go into the landslide area. The land may still be shifting.

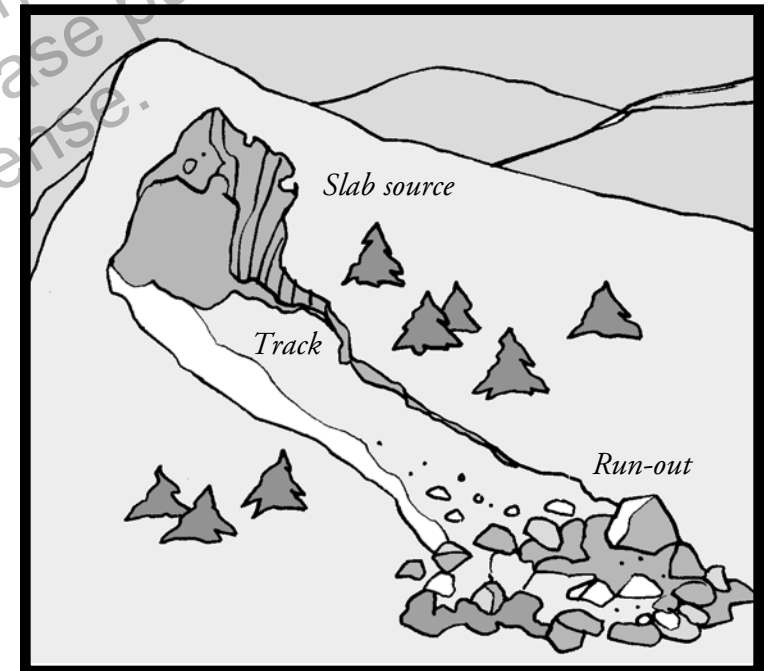
Avalanches

Avalanches are a lot like landslides. They are both caused by gravity. But, avalanches are slides of snow, ice, and rock.

On mountains, snow piles up in layers. There might be ice or air between the layers. Sometimes, the layers slide away from each other. This causes an avalanche. Some slides are just loose snow. Others are huge slabs of snow and ice. These big slides can bury people.

Most avalanches happen very high in snowy mountains. Skiers and mountain climbers are in the most danger of being buried.

Most ski resorts have avalanche warnings. Don't go out when there is a warning. If you get caught in a slide, try to stay above the snow. If you get buried, put one hand in front of your face. This keeps a pocket of air clear, so you can breathe. Wait for rescue.



This slab avalanche will cause the entire slab of snow and ice to race downhill. This is the most dangerous type of avalanche.

Fire

Fire also changes Earth. This type of change is always a fast change.

Forest Fires

You might think that all fires are bad. However, a few fires are good for forests. Some plants need fire to release seeds. Also, bigger plants and trees need fire to clear out smaller plants. This makes room for new growth. These good fires start because of lightning or heat on dry leaves.

Other fires can be damaging. They burn too hot and are too large. They can burn down neighborhoods where people live.

Firefighters and park rangers work hard to stop damaging fires. They dig long **trenches**. These dirt trenches will not burn. This keeps the fire from spreading. Firefighters also may dump dirt or water on the fire. They do this by hand or by flying airplanes over the fire.

If you are near a forest fire, get away quickly. Listen to the news to find the best way to escape. This is not something you can plan ahead. You never know which way the fire will turn.

trench: a long, narrow ditch

Let It Burn?

Hikers spot smoke on a hillside in southern California. A park ranger flies over the site. Sure enough, it's the beginning of a forest fire. Should people put out the blaze or let it burn? The answer is not so easy. Scientists need to answer questions such as:

- What types of plants are in the forest?
- How rapidly will the forest burn?
- Has there been a fire in the area recently? Do some plants need this fire to survive?
- What is the weather likely to be in the coming days? How quickly will the fire spread?
- How close will the fire come to people and buildings? Can these people get to safety?

– Analyze –

*What data would you collect to answer these questions?
What other questions would you ask?*

Scientists who study forest fires spend years gathering **data** about forests and fires. Then they can make good decisions when a fire starts.

If scientists decide to let this fire burn, some people will not be happy. These people may think all forest fires are bad. They may be afraid the fire will reach their homes. How could scientists tell people this burn is good for the land?

– Summarize –

Describe how we know that the surface of Earth undergoes fast changes.

data: information; facts

Glossary

career—the work or a series of jobs a person has

data—information; facts

degree—a rank given to a student for completing a course of study

dramatic—very noticeable

erupt—to explode with great force

lava—molten rock that flows or bursts from a volcano

trench—a long, narrow ditch

To Find Out More . . .

Want to learn more about fast Earth-changing processes?

Try these books

Volcanoes and Earthquakes by Andres Llamas Ruiz. Sterling Publishing Company, Inc., 1997.

Forest Fires by Luke Thompson. Children's Press, 2000.

Access these Web sites

U.S. Department of Labor Occupational Outlook Handbook: Geoscientists
<http://www.bls.gov/oco/ocos288.htm>

FEMA for Kids: Federal Emergency Management Agency
<http://www.fema.gov/kids/>

USDA Forest Service
<http://www.fs.fed.us/>

Write for more information

USDA Forest Service
1400 Independence Ave., SW
Washington, D.C. 20250-0003

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Assessments

Fast Earth-Changing Processes

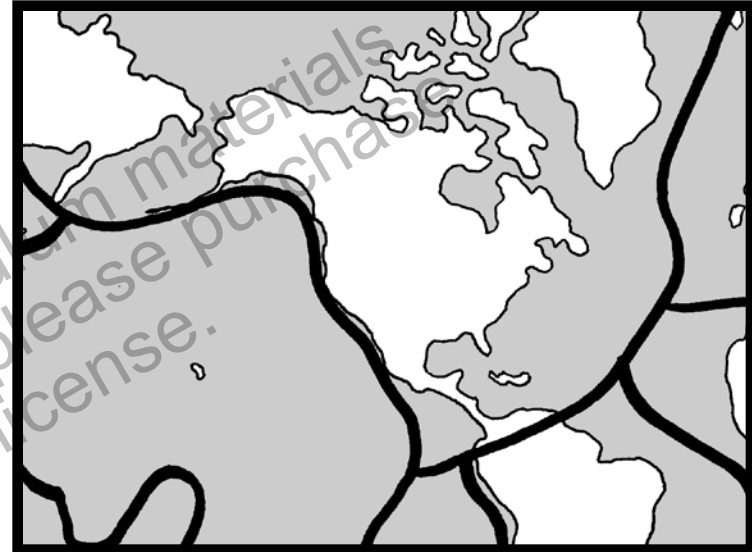
Print pages 20–22 of this PDF for the assessments.

Check Understanding

Shade the circle next to the correct answer.

1. A class took a field trip. They were having a good time. Then, an avalanche warning was issued. They evacuated quickly and got home safely. Where did the class go on the field trip?
 - Ⓐ exploring a city
 - Ⓑ hiking in a forest
 - Ⓒ skiing on a mountain
 - Ⓓ swimming in the ocean
2. How does a volcano begin to form?
 - Ⓐ Two plates get stuck together.
 - Ⓑ Snow and ice piles up in layers.
 - Ⓒ Loose rocks and dirt move downhill.
 - Ⓓ Heat from plates rubbing together melts rock.

3. The map below shows fault lines.



A fault line runs along the west coast of the United States. Which process occurs along fault lines?

- Ⓐ landslide
- Ⓑ avalanche
- Ⓒ forest fire
- Ⓓ earthquake

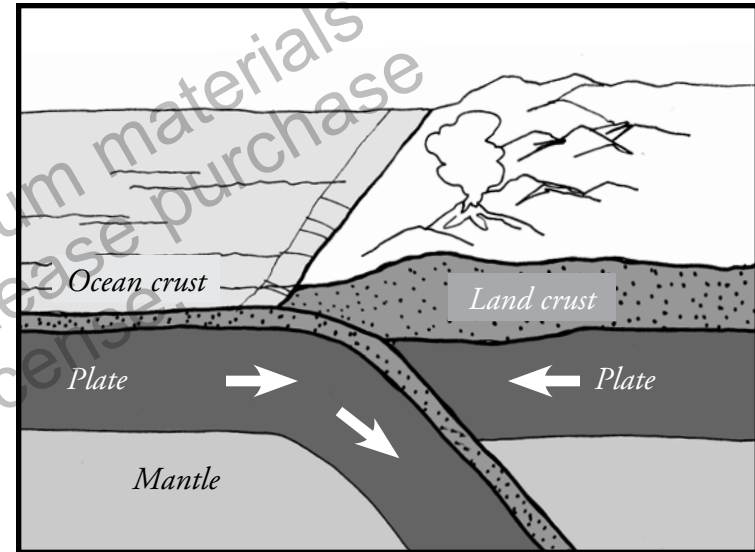
Check Understanding

Shade the circle next to the correct answer or write your answer on the lines provided.

4. Sometimes one fast Earth-changing process can trigger another. Identify two processes caused by other processes.

Explain how these two processes are connected.

5. The diagram below shows the movement of plates under Earth's crust.



Which fast Earth-changing process is likely to occur when plates move in this way?

- Ⓐ avalanche
- Ⓑ earthquake
- Ⓒ landslide
- Ⓓ forest fire

Assessment Scoring Guidelines

1. Answer C is correct.
2. Answer D is correct.
3. Answer D is correct.

4. Landslide

A landslide can follow an earthquake, which has already loosened rocks and dirt.

Tsunami

An underwater earthquake makes huge waves, which can be dangerous to people on land.

5. Answer B is correct.

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English Language Arts Activities

Fast Earth-Changing Processes

Print pages 24–28 of this PDF for the reading activities.

Use the Correct Spelling

TRY THE SKILL

Some words sound the same but have different spellings. They also have different meanings. You can use clues from the rest of the sentence to decide which spelling is correct.

For example, these three spellings sound the same:
too, two, and to.

I'm coming, too.
(*Too* means "also.")

We have two hours to wait.
(*Two* means "2.")

Please give that to me.
(*To* is a preposition that shows relationships.)

These two spellings also sound the same:
fir and fur.

We planted 200 fir trees.
(*Fir* is a kind of evergreen tree.)

Did you brush your dog's fur?
(*Fur* is a hairy coat.)

Read each sentence and the pair of spellings below it. Then write the letter of the correct spelling on the line.

- The storm included thunder and _____.
A. lightening B. lightning
- A strong _____ in a river can cause erosion.
A. current B. currant
- The center of Earth is soft and _____ hot.
A. vary B. very
- The center of Earth is called the _____.
A. mantle B. mantel
- During an earthquake, you should _____ for the ground to stop shaking.
A. wait B. weight

Summarize

TRY THE SKILL

Summarizing means retelling what you have read. Summaries are shorter than the text you read and help you understand the most important information.

Read this paragraph from *Fast Earth-Changing Processes*. Try summarizing it.

Earth is always changing. Most changes happen slowly. On sandy beaches, the wind blows sand into large piles called sand dunes. Rivers slowly wash dirt and small rocks downstream to the ocean.

Is this a good summary?

On sandy beaches, the wind blows sand into large piles called sand dunes.

No! This statement is too specific and does not summarize the main idea.

How about the one below? Is this a good summary?

Earth is always changing. Some changes are slow and gentle.

Yes! This is the main idea of the paragraph.

Read the paragraphs. Shade the circle next to the best summary.

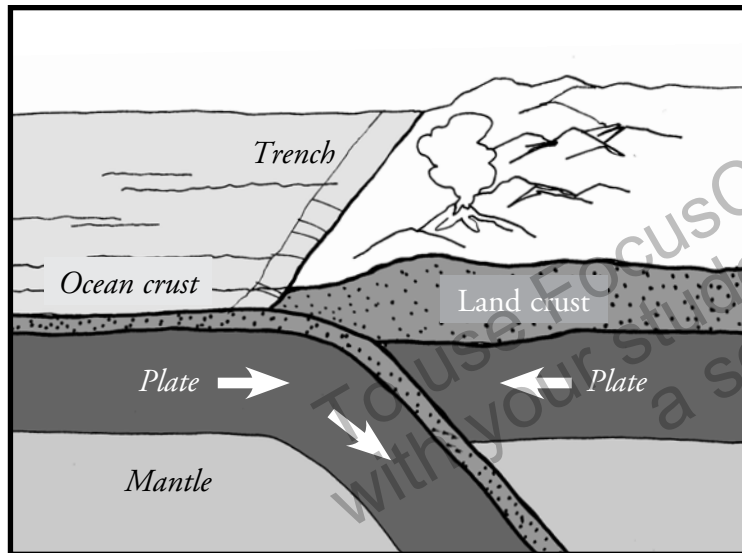
1. Earth is changing quickly, too. These fast changes are very dramatic. They can harm plants and animals. They can put people in danger, too. Sometimes, they even bring down buildings.
 - Ⓐ Sometimes, these changes even bring down buildings.
 - Ⓑ Earth changes quickly, too, which can be dangerous.
 - Ⓒ The fast changes can kill plants and animals.
2. When two plates move suddenly, there is an earthquake. Sometimes, this brings gentle shaking. Other times, the shaking brings down buildings.
 - Ⓐ All earthquakes bring gentle shaking to Earth.
 - Ⓑ When there is an earthquake, buildings always fall down.
 - Ⓒ When two plates move, an earthquake shakes Earth.

Interpret Graphics

TRY THE SKILL

Graphics give you a lot of information quickly. Understanding graphics can help you understand what you read.

Look at this graphic from *Fast Earth-Changing Processes*.

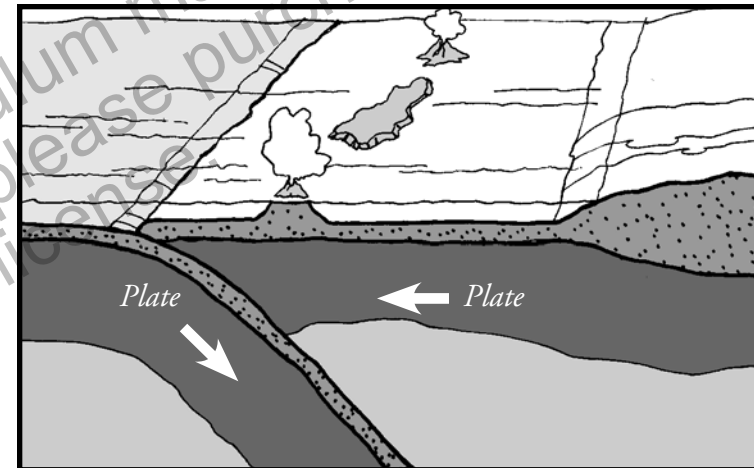


What does this graphic tell you?

A volcano forms when the ocean crust moves under the land crust.

Use the words in the box to label this graphic. Then, answer the question.

Ocean crust Mantle Land crust Trench



1. What happens when one piece of Earth's crust moves under another in the ocean?

- Ⓐ A huge avalanche occurs in the ocean floor.
- Ⓑ Volcanoes form and eventually make islands.
- Ⓒ Earthquakes shake down buildings and bridges.

Steps in a Process

TRY THE SKILL

Understanding the steps in a process can help you understand and remember what you read. You can summarize the steps in a process. To do this, use words such as *first*, *then*, *next*, and *finally*.

Read this passage from *Fast Earth-Changing Processes* and try to identify the steps in the process.

Most ski resorts have avalanche warnings. Don't go out when there is a warning. If you get caught in a slide, try to stay above the snow. If you get buried, put one hand in front of your face. This keeps a pocket of air clear, so you can breathe. Wait for rescue.

**What should you do to stay safe in an avalanche?
A graphic organizer can help you identify the steps.**

Step 1	First, don't go out when there is an avalanche warning.
Step 2	If you get caught in a slide, try to stay above the snow.
Step 3	Next, if you get buried, put one hand in front of your face.
Step 4	Finally, wait for rescue.

Read this passage from *Fast Earth-Changing Processes*. How can you stay safe in a tsunami? Identify the steps in the process. Use the graphic organizer to help.

Scientists usually know when a big wave is coming. People can do some simple things to stay safe. First, listen to the news. It will tell you if a big wave is coming. Next, if a wave is on the way, get to higher ground. You should have a plan for escape. Finally, do not go back to the ocean after the first big wave. There is usually more than one large wave.

Step 1	
Step 2	
Step 3	

Answer Key

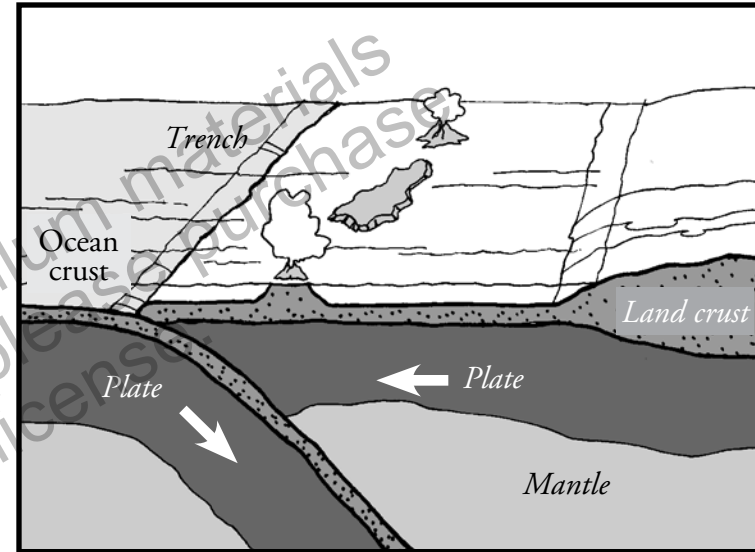
Use the Correct Spelling

1. B
2. A
3. B
4. A
5. A

Summarize

1. B
2. C

Interpret Graphics



1. B

Steps in a Process

Step 1: First, listen to the news. It will tell you if a big wave is coming.

Step 2: Next, if a wave is on the way, get to higher ground. You should have a plan for escape.

Step 3: Finally, do not go back to the ocean after the first big wave. There is usually more than one large wave.