

Grade 4 Reading & Writing

Unit 5: Geology

16 lessons (the last is the Pausing Point review) and a words quiz. Use this pack with the unit's **Teacher Guide** and **Activity Book** and **Reader** (download them once from the course) to teach the whole unit without the internet.

What is in this pack

- A plan for each lesson: the Teacher Guide pages to follow, words to know, what to read, questions to talk over and the Activity Book pages to print.
- The words quiz, ready to print.
- Answers for the teacher at the back: every discussion question and the quiz key.

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Lesson schedule

One lesson a school day, about 60–90 minutes; split long lessons over two days. Tick each one off as you go.

	Lesson	Reader pages	Activity Book
☐	Lesson 1: Chapter 1, “Earth’s Changing Surface”	PDF pages 8–17	AP 1.1, AP 1.2, AP 1.4, AP 1.5, AP 1.6, SR 1, SR 2, SR 3
☐	Lesson 2: Chapter 2, “Earth’s Layers and Moving Plates”	PDF pages 18–27	AP 2.1, AP 2.2, AP 2.3, AP 2.4
☐	Lesson 3: Chapter 2, “Earth’s Layers and Moving Plates”	PDF pages 18–27	AP 3.1
☐	Lesson 4: Chapter 3, “Earth’s Shakes and Quakes”	PDF pages 28–37	AP 4.1, AP 4.2, AP 4.3, AP 4.4
☐	Lesson 5: Chapter 3, “Earth’s Shakes and Quakes”	PDF pages 28–37	AP 5.1, AP 5.2, AP 5.3
☐	Lesson 6: Chapter 4, “Earth’s Fiery Volcanoes”	PDF pages 38–47	AP 6.1, AP 6.2, AP 6.3, AP 6.4, AP 6.5
☐	Lesson 7: Chapter 5, “Mythic Volcano Spirits”	PDF pages 48–57	AP 7.1, AP 7.2, AP 7.3, AP 7.4, AP 7.5
☐	Lesson 8: Chapter 6, “Earth’s Building Blocks”	PDF pages 58–67	AP 8.1, AP 8.2, AP 8.3, AP 8.4
☐	Lesson 9: Chapter 6, “Earth’s Building Blocks”	PDF pages 58–67	AP 9.1, AP 9.2, AP 9.3, AP 9.4
☐	Lesson 10: Chapter 7, “Earth’s Powerful Forces of Change”	PDF pages 68–77	AP 10.1, AP 10.2, AP 10.3
☐	Lesson 11: Chapter 7, “Earth’s Powerful Forces of Change”	PDF pages 68–77	AP 11.1, AP 11.2, AP 11.3, AP 11.4
☐	Lesson 12: Chapter 8, “Earth’s Mighty Mountains”	PDF pages 78–87	AP 12.1, AP 12.2, AP 12.3
☐	Lesson 13: Chapter 9, “Earth’s Undersea World”	PDF pages 88–124	AP 13.1, AP 13.2
☐	Lesson 14: Chapter 9, “Earth’s Undersea World”	PDF pages 88–124	AP 14.1, AP 14.2, AP 14.3, AP 14.4

	Lesson	Reader pages	Activity Book
☐	Lesson 15: Spelling	—	AP 15.1, AP 15.2
☐	Pausing Point: Review, extra practice and answer keys	—	PP 1, PP 2, PP 3, PP 4, PP 5, PP 6, PP 7, PP 8
☐	Words quiz	—	—

Page numbers are the PDF page numbers of the Student Reader file, so they match what your PDF reader shows.

Lesson 1: Chapter 1, “Earth’s Changing Surface”

THE BIG QUESTION

How did people’s understanding of what was happening on Earth’s surface change over time?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **climate** — the average weather conditions of a particular area
- **continental drift** — a process in which continents slowly move over time on the surface of the earth
- **dense** — thick or heavy (denser) deposit, 1. v. to put or leave something in a particular place; 2. n. material laid down or left by a natural process (v. deposited, n. deposits)
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **foundation** — the basis of something, the support upon which something else is built
- **hypothesis** — an idea that has been suggested and may be true but has not yet been proven
- **magma** — melted rock in Earth’s mantle
- **observation** — 1. the act of paying careful attention to gather information; 2. a statement based on paying careful attention to something
- **theory** — an explanation for why something happens based on evidence

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 15–39: the steps, materials and timing for this lesson.

Read

Read Chapter 1, “Earth’s Changing Surface”: PDF pages 8–17. Look at the pictures and maps together.

Talk it over

1. What conclusions did scientists make about the history of the earth based on the evidence they observed?
2. One meaning of the word dramatic is “very noticeable.” How might the observations made by European scientists be considered dramatic results?
3. How did other scientists in the early 1900s respond to Wegener’s hypothesis?
4. Why did scientists respond this way?

5. During the 1700s and 1800s, which observations were made from evidence gathered over long periods of time that indicated Earth's surface features do change?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 1.1: Areas of Study about the Earth — Activity Book, PDF pages 7–8
- Activity Page 1.2: Vocabulary for “Earth’s Changing Surface” — Activity Book, PDF pages 9–14
- Activity Page 1.4: Evidence of Changes on Earth — Activity Book, PDF pages 15–16
- Activity Page 1.5: Excerpt from “Earth’s Changing Surface” — Activity Book, PDF pages 17–20
- Activity Page 1.6: Glossary for The Changing — Activity Book, PDF pages 21–26
- Student Resource 1: Individual Code Chart — Activity Book, PDF pages 195–202
- Student Resource 2: Wiki Entry Rubric — Activity Book, PDF pages 203–204
- Student Resource 3: Wiki Entry Editing Checklist — Activity Book, PDF pages 205–208

Check for understanding

- Answer the Big Question in a sentence or two: How did people’s understanding of what was happening on Earth’s surface change over time?
- Use one of today’s words in a sentence of your own.

Lesson 2: Chapter 2, “Earth’s Layers and Moving Plates”

THE BIG QUESTION

How do tectonic plates and Earth’s layers interact to change the surface of the earth?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **basin** — a large area in the earth that is lower than the area around it
- **continental drift** — a process in which continents slowly move over time on the surface of the earth
- **dense** — thick or heavy (denser) deposit, 1. v. to put or leave something in a particular place; 2. n. material laid down or left by a natural process (v. deposited, n. deposits)
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **hypothesis** — an idea that has been suggested and may be true but has not yet been proven
- **magma** — melted rock in Earth’s mantle
- **ocean trench** — a narrow, extremely deep valley formed when the seafloor dips down as one tectonic plate slides under another
- **plate tectonics** — a theory that Earth’s crust and the solid top part of the mantle are broken up into sections that fit together but move against each other
- **pressure** — the weight or force produced when something presses or pushes against something else

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 40–63: the steps, materials and timing for this lesson.

Read

Read Chapter 2, “Earth’s Layers and Moving Plates”: PDF pages 18–27. Look at the pictures and maps together.

Talk it over

1. What did scientists learn from studying seismic waves?
2. Why did scientists suspect that ocean trenches were part of the answer to the puzzle of continental drift?

3. How does the theory of plate tectonics provide an explanation for how continents can move?
4. What is subduction?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 2.1: Vocabulary for “Earth’s Layers and Moving Plates” — Activity Book, PDF pages 27–28
- Activity Page 2.2: Practice Commas — Activity Book, PDF pages 29–30
- Activity Page 2.3: -ly: Suffix Meaning “in a — Activity Book, PDF pages 31–32
- Activity Page 2.4: Similes about Earth’s Changes — Activity Book, PDF pages 33–34

Check for understanding

- Answer the Big Question in a sentence or two: How do tectonic plates and Earth’s layers interact to change the surface of the earth?
- Use one of today’s words in a sentence of your own.

Lesson 3: Chapter 2, “Earth’s Layers and Moving Plates”

THE BIG QUESTION

How do tectonic plates and Earth’s layers interact to change the surface of the earth?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **basin** — a large area in the earth that is lower than the area around it
- **continental drift** — a process in which continents slowly move over time on the surface of the earth
- **dense** — thick or heavy (denser) deposit, 1. v. to put or leave something in a particular place; 2. n. material laid down or left by a natural process (v. deposited, n. deposits)
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **hypothesis** — an idea that has been suggested and may be true but has not yet been proven
- **magma** — melted rock in Earth’s mantle
- **ocean trench** — a narrow, extremely deep valley formed when the seafloor dips down as one tectonic plate slides under another
- **plate tectonics** — a theory that Earth’s crust and the solid top part of the mantle are broken up into sections that fit together but move against each other
- **pressure** — the weight or force produced when something presses or pushes against something else

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 64–80: the steps, materials and timing for this lesson.

Read

Read Chapter 2, “Earth’s Layers and Moving Plates”: PDF pages 18–27. Look at the pictures and maps together.

Talk it over

1. What information in the text helps you determine whether Earth’s crust is liquid or solid?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 3.1: Excerpt from “Earth’s Layers and Moving Plates” — Activity Book, PDF pages 35–40

Check for understanding

- Answer the Big Question in a sentence or two: How do tectonic plates and Earth’s layers interact to change the surface of the earth?
- Use one of today’s words in a sentence of your own.

Lesson 4: Chapter 3, “Earth’s Shakes and Quakes”

THE BIG QUESTION

What happens beneath Earth’s surface to cause earthquakes?

Words to know

- **basin** — a large area in the earth that is lower than the area around it
- **experiment** — a scientific test to try out something in order to learn about it *extinct volcano, n. a type of volcano that has not erupted for at least 10,000 years
- **eyewitness** — a person who has seen something happen and is able to describe it
- **fault** — a crack in Earth’s crust (faults) *fault-block mountains, n. mountains formed when gigantic blocks of rock move up and down along faults
- **heave** — 1. to move up and down over and over; 2. to lift, pull, push, or throw with a lot of effort
- **pinpoint** — to figure out the exact location of something
- **pressure** — the weight or force produced when something presses or pushes against something else
- **theory** — an explanation for why something happens based on evidence
- **trigger** — to cause something to start or happen
- **tsunami** — a gigantic wave of seawater caused by an earthquake in oceanic crust

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 81-101: the steps, materials and timing for this lesson.

Read

Read Chapter 3, “Earth’s Shakes and Quakes”: PDF pages 28-37. Look at the pictures and maps together.

Talk it over

1. What is a synonym for the word penned in the first sentence?
2. How does the author describe earthquakes here?
3. What role do faults play in earthquakes?
4. The author compares an earthquake’s focus to a heart. Why do you think the author does this?
5. What are two ways scientists measure the intensity of earthquakes?
6. How are earthquakes and tsunamis connected?

7. What happens beneath Earth's surface to cause earthquakes?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 4.1: Vocabulary for "Earth's Shakes and Quakes" — Activity Book, PDF pages 41–42
- Activity Page 4.2: Excerpt from "Earth's Shakes and Quakes" — Activity Book, PDF pages 43–44
- Activity Page 4.3: Practice Commas — Activity Book, PDF pages 45–46
- Activity Page 4.4: -ly: Suffix Meaning "in a — Activity Book, PDF pages 47–48

Check for understanding

- Answer the Big Question in a sentence or two: What happens beneath Earth's surface to cause earthquakes?
- Use one of today's words in a sentence of your own.

Lesson 5: Chapter 3, “Earth’s Shakes and Quakes”

THE BIG QUESTION

What happens beneath Earth’s surface to cause earthquakes?

Words to know

- **basin** — a large area in the earth that is lower than the area around it
- **experiment** — a scientific test to try out something in order to learn about it *extinct volcano, n. a type of volcano that has not erupted for at least 10,000 years
- **eyewitness** — a person who has seen something happen and is able to describe it
- **fault** — a crack in Earth’s crust (faults) *fault-block mountains, n. mountains formed when gigantic blocks of rock move up and down along faults
- **heave** — 1. to move up and down over and over; 2. to lift, pull, push, or throw with a lot of effort
- **pinpoint** — to figure out the exact location of something
- **pressure** — the weight or force produced when something presses or pushes against something else
- **theory** — an explanation for why something happens based on evidence
- **trigger** — to cause something to start or happen
- **tsunami** — a gigantic wave of seawater caused by an earthquake in oceanic crust

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 102–119: the steps, materials and timing for this lesson.

Read

Read Chapter 3, “Earth’s Shakes and Quakes”: PDF pages 28–37. Look at the pictures and maps together.

Talk it over

1. How much energy is released when blocks of rock that were stuck break and slip past each other?
2. How is a seismograph different from the Richter scale?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 5.1: Earth’s Shakes and Quakes — Activity Book, PDF pages 49–50
- Activity Page 5.2: Take Notes on Tsunamis — Activity Book, PDF pages 51–52

■ Activity Page 5.3: Tsunami Pamphlet — Activity Book, PDF pages 53–54

Check for understanding

- Answer the Big Question in a sentence or two: What happens beneath Earth’s surface to cause earthquakes?
- Use one of today’s words in a sentence of your own.

Lesson 6: Chapter 4, “Earth’s Fiery Volcanoes”

THE BIG QUESTION

How do scientists determine where volcanoes might develop?

Words to know

- **crater** — a bowl-shaped opening at the top of a volcano or geyser *crust, n. Earth’s outermost layer, featuring a rocky surface
- **erupt** — to send out rock, lava, and ash in a sudden explosion (erupted, n. eruption)
- **fine** — very small
- **hotspot** — a very hot region deep within Earth’s mantle where a huge magma chamber forms
- **magma** — melted rock in Earth’s mantle
- **plume** — a column of magma that rises from the mantle into a chamber beneath Earth’s crust
- **pressure** — the weight or force produced when something presses or pushes against something else
- **sea level** — the average height of the ocean’s surface
- **subduction zone** — the place where one tectonic plate is sliding beneath another tectonic plate
- **trigger** — to cause something to start or happen

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 120–143: the steps, materials and timing for this lesson.

Read

Read Chapter 4, “Earth’s Fiery Volcanoes”: PDF pages 38–47. Look at the pictures and maps together.

Talk it over

1. According to the text, what are some ways erupting volcanoes can change Earth’s surface?
2. What are the differences between active, dormant, and extinct volcanoes?
3. How does an undersea volcano become a chain of islands?
4. What happens both above and below Earth’s surface to form geysers?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 6.1: Vocabulary for “Earth’s Fiery Volcanoes” — Activity Book, PDF pages 55–56
- Activity Page 6.2: Commas and Quotation Marks — Activity Book, PDF pages 57–58
- Activity Page 6.3: Root rupt — Activity Book, PDF pages 59–60
- Activity Page 6.4: Spelling Words — Activity Book, PDF pages 61–62
- Activity Page 6.5: Practice Spelling Words — Activity Book, PDF pages 63–64

Check for understanding

- Answer the Big Question in a sentence or two: How do scientists determine where volcanoes might develop?
- Use one of today’s words in a sentence of your own.

Lesson 7: Chapter 5, “Mythic Volcano Spirits”

THE BIG QUESTION

How do volcano myths help explain volcanic activity?

Words to know

- **bitter** — 1. resentful and angry because of unfair treatment; 2. very cold
- **caldera** — a crater caused by the collapse of the top of a volcano
- **crater** — a bowl-shaped opening at the top of a volcano or geyser *crust, n. Earth’s outermost layer, featuring a rocky surface
- **erupt** — to send out rock, lava, and ash in a sudden explosion (erupted, n. eruption)
- **eternal** — lasting forever, with no beginning and no end
- **lofty** — high up
- **outsmart** — to trick or defeat someone by being clever
- **revenge** — the act of getting even for a wrongdoing *rock cycle, n. the continuous cycle in which rocks are created, destroyed, and recreated
- **strong-willed** — determined to do what you want even if other people tell you not to *subduction, n. a process in which a heavier oceanic plate slides under a lighter continental plate
- **volcano** — a hill or mountain that forms over a crack in Earth’s crust from which lava erupts (volcanoes) *weather, v. to break down into smaller pieces (n. weathering)

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 144–168: the steps, materials and timing for this lesson.

Read

Read Chapter 5, “Mythic Volcano Spirits”: PDF pages 48–57. Look at the pictures and maps together.

Talk it over

1. What is a synonym for the word spirits as it is used in this context?
2. According to the text, how did people make sense of volcanic eruptions?
3. What natural occurrence is being explained in this passage?
4. What events are being depicted in the images on these pages? How do you know?
5. What volcanic activity does this passage explain?
6. What volcanic feature does this passage explain?
7. How do scientists think Crater Lake was formed?
8. What volcanic activity is explained in this passage?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 7.1: Vocabulary for “Mythic Volcano Spirits” — Activity Book, PDF pages 65–66
- Activity Page 7.2: Mythic Volcano Spirits — Activity Book, PDF pages 67–68
- Activity Page 7.3: Excerpts from The Changing Earth — Activity Book, PDF pages 69–78
- Activity Page 7.4: Wiki Entry Rubric — Activity Book, PDF pages 79–80
- Activity Page 7.5: Wiki Entry Editing Checklist — Activity Book, PDF pages 81–82

Check for understanding

- Answer the Big Question in a sentence or two: How do volcano myths help explain volcanic activity?
- Use one of today’s words in a sentence of your own.

Lesson 8: Chapter 6, “Earth’s Building Blocks”

THE BIG QUESTION

How can changes in rocks over time be explained by the rock cycle?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **dissolved** — mixed with liquid so no solid pieces are visible anymore
- **durable** — able to last a long time in good condition
- **erupt** — to send out rock, lava, and ash in a sudden explosion (erupted, n. eruption)
- **fine** — very small
- **granite** — a common igneous rock that forms from magma that cooled within Earth’s crust
- **magma** — melted rock in Earth’s mantle
- **mineral** — a solid, nonliving substance found in the earth that makes up rocks
- **obsidian** — a dark rock or natural glass formed from lava that cooled very quickly
- **pressure** — the weight or force produced when something presses or pushes against something else

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 169–186: the steps, materials and timing for this lesson.

Read

Read Chapter 6, “Earth’s Building Blocks”: PDF pages 58–67. Look at the pictures and maps together.

Talk it over

1. What are rocks?
2. How does igneous rock form?
3. How does sedimentary rock form?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 8.1: Vocabulary for “Earth’s Building Blocks” — Activity Book, PDF pages 83–84
- Activity Page 8.2: Earth’s Building Blocks — Activity Book, PDF pages 85–88
- Activity Page 8.3: Take Notes on a Volcano — Activity Book, PDF pages 89–90
- Activity Page 8.4: Volcano Wiki Entry — Activity Book, PDF pages 91–92

Check for understanding

- Answer the Big Question in a sentence or two: How can changes in rocks over time be explained by the rock cycle?
- Use one of today's words in a sentence of your own.

Lesson 9: Chapter 6, “Earth’s Building Blocks”

THE BIG QUESTION

How can changes in rocks over time be explained by the rock cycle?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **dissolved** — mixed with liquid so no solid pieces are visible anymore
- **durable** — able to last a long time in good condition
- **erupt** — to send out rock, lava, and ash in a sudden explosion (erupted, n. eruption)
- **fine** — very small
- **granite** — a common igneous rock that forms from magma that cooled within Earth’s crust
- **magma** — melted rock in Earth’s mantle
- **mineral** — a solid, nonliving substance found in the earth that makes up rocks
- **obsidian** — a dark rock or natural glass formed from lava that cooled very quickly
- **pressure** — the weight or force produced when something presses or pushes against something else

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 187–202: the steps, materials and timing for this lesson.

Read

Read Chapter 6, “Earth’s Building Blocks”: PDF pages 58–67. Look at the pictures and maps together.

Activity Book pages

- Activity Page 9.1: Excerpt from “Earth’s Building Blocks” — Activity Book, PDF pages 93–98
- Activity Page 9.2: Commas and Quotation Marks — Activity Book, PDF pages 99–100
- Activity Page 9.3: Root rupt — Activity Book, PDF pages 101–102
- Activity Page 9.4: Practice Spelling Words — Activity Book, PDF pages 103–104

Check for understanding

- Answer the Big Question in a sentence or two: How can changes in rocks over time be explained by the rock cycle?
- Use one of today’s words in a sentence of your own.

Lesson 10: Chapter 7, “Earth’s Powerful Forces of Change”

THE BIG QUESTION

How do weathering and erosion continually reshape Earth’s surface?

Words to know

- **canyon** — a deep valley with steep sides and often a stream or river flowing through it
- **climate** — the average weather conditions of a particular area
- **contract** — to shrink slightly or get smaller
- **dissolved** — mixed with liquid so no solid pieces are visible anymore
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **expand** — to get bigger
- **fine** — very small
- **lofty** — high up
- **pepper** — to sprinkle or cover *physical weathering, n. a process that breaks big rocks into smaller rocks without changing the minerals they contain
- **sea level** — the average height of the ocean’s surface

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 203–223: the steps, materials and timing for this lesson.

Read

Read Chapter 7, “Earth’s Powerful Forces of Change”: PDF pages 68–77. Look at the pictures and maps together.

Talk it over

1. How does wind cause weathering and erosion?
2. How are sediments and sedimentary rock related?
3. Based on the information in the text, how does the amount of flowing water affect the type of sediments that are eroded?
4. What is one example or piece of evidence provided on these pages that weathering, erosion, and time work together to change Earth’s surface?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 10.1: Spelling Assessment — Activity Book, PDF pages 105–106
- Activity Page 10.2: Vocabulary for “Earth’s Powerful Forces of Change” — Activity Book, PDF pages 107–108
- Activity Page 10.3: Earth’s Powerful Forces of Change — Activity Book, PDF pages 109–110

Check for understanding

- Answer the Big Question in a sentence or two: How do weathering and erosion continually reshape Earth’s surface?
- Use one of today’s words in a sentence of your own.

Lesson 11: Chapter 7, “Earth’s Powerful Forces of Change”

THE BIG QUESTION

How do weathering and erosion continually reshape Earth’s surface?

Words to know

- **canyon** — a deep valley with steep sides and often a stream or river flowing through it
- **climate** — the average weather conditions of a particular area
- **contract** — to shrink slightly or get smaller
- **dissolved** — mixed with liquid so no solid pieces are visible anymore
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **expand** — to get bigger
- **fine** — very small
- **lofty** — high up
- **pepper** — to sprinkle or cover *physical weathering, n. a process that breaks big rocks into smaller rocks without changing the minerals they contain
- **sea level** — the average height of the ocean’s surface

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 224–245: the steps, materials and timing for this lesson.

Read

Read Chapter 7, “Earth’s Powerful Forces of Change”: PDF pages 68–77. Look at the pictures and maps together.

Activity Book pages

- Activity Page 11.1: Sequencing Multiple Adjectives — Activity Book, PDF pages 111–112
- Activity Page 11.2: Review Suffixes -ly and -y and Roots graph and rupt — Activity Book, PDF pages 113–114
- Activity Page 11.3: Spelling Words — Activity Book, PDF pages 115–116
- Activity Page 11.4: Practice Spelling Words — Activity Book, PDF pages 117–118

Check for understanding

- Answer the Big Question in a sentence or two: How do weathering and erosion continually reshape Earth's surface?
- Use one of today's words in a sentence of your own.

Lesson 12: Chapter 8, “Earth’s Mighty Mountains”

THE BIG QUESTION

How do the movements and forces of tectonic plates build mountains?

Words to know

- **basin** — a large area in the earth that is lower than the area around it
- **bitter** — 1. resentful and angry because of unfair treatment; 2. very cold
- **bulge** — to stick out or swell
- **erupt** — to send out rock, lava, and ash in a sudden explosion (erupted, n. eruption)
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **fault** — a crack in Earth’s crust (faults) *fault-block mountains, n. mountains formed when gigantic blocks of rock move up and down along faults
- **granite** — a common igneous rock that forms from magma that cooled within Earth’s crust
- **heave** — 1. to move up and down over and over; 2. to lift, pull, push, or throw with a lot of effort
- **magma** — melted rock in Earth’s mantle
- **plate tectonics** — a theory that Earth’s crust and the solid top part of the mantle are broken up into sections that fit together but move against each other

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 246–265: the steps, materials and timing for this lesson.

Read

Read Chapter 8, “Earth’s Mighty Mountains”: PDF pages 78–87. Look at the pictures and maps together.

Talk it over

1. What role have tectonic plates had in changing Earth’s features?
2. What evidence in the text supports this role?
3. According to the text, how are fold mountains formed?
4. What are some common features of fold mountains?
5. How are fault-block mountains formed?
6. What are some common features of faultblock mountains mentioned in the text?

7. According to the text, how are dome mountains formed?
8. What are some common features of dome mountains?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 12.1: Vocabulary for “Earth’s Mighty Mountains” — Activity Book, PDF pages 119–120
- Activity Page 12.2: Earth’s Mighty Mountains — Activity Book, PDF pages 121–122
- Activity Page 12.3: Planning a Descriptive Paragraph — Activity Book, PDF pages 123–124

Check for understanding

- Answer the Big Question in a sentence or two: How do the movements and forces of tectonic plates build mountains?
- Use one of today’s words in a sentence of your own.

Lesson 13: Chapter 9, “Earth’s Undersea World”

THE BIG QUESTION

How does the movement of tectonic plates shape and change the seafloor?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **canyon** — a deep valley with steep sides and often a stream or river flowing through it
- **climate** — the average weather conditions of a particular area
- **clustered** — grouped close together *coal, n. a dark, solid substance in the earth formed from plant fossils and used as fuel *collide, v. to crash together with strong force
- **continental drift** — a process in which continents slowly move over time on the surface of the earth
- **crater** — a bowl-shaped opening at the top of a volcano or geyser *crust, n. Earth’s outermost layer, featuring a rocky surface
- **dense** — thick or heavy (denser) deposit, 1. v. to put or leave something in a particular place; 2. n. material laid down or left by a natural process (v. deposited, n. deposits)
- **descend** — to move downward
- **detective** — a person whose job is to find information about someone or something
- **dissolved** — mixed with liquid so no solid pieces are visible anymore

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 266–281: the steps, materials and timing for this lesson.

Read

Read Chapter 9, “Earth’s Undersea World”: PDF pages 88–124. Look at the pictures and maps together.

Talk it over

1. What is seafloor spreading?
2. Why is the chain of mid-ocean ridges the most volcanically active mountain range in the world?
3. How are they formed?
4. What is an ocean trench?
5. Why have only three people traveled to the bottom of the Mariana Trench?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 13.1: Vocabulary for “Earth’s Undersea World” — Activity Book, PDF pages 125–126
- Activity Page 13.2: Excerpt from “Earth’s Undersea World” — Activity Book, PDF pages 127–130

Check for understanding

- Answer the Big Question in a sentence or two: How does the movement of tectonic plates shape and change the seafloor?
- Use one of today’s words in a sentence of your own.

Lesson 14: Chapter 9, “Earth’s Undersea World”

THE BIG QUESTION

How does the movement of tectonic plates shape and change the seafloor?

Words to know

- **basalt** — heavy, dense rock formed from cooled, hardened lava
- **canyon** — a deep valley with steep sides and often a stream or river flowing through it
- **climate** — the average weather conditions of a particular area
- **clustered** — grouped close together *coal, n. a dark, solid substance in the earth formed from plant fossils and used as fuel *collide, v. to crash together with strong force
- **continental drift** — a process in which continents slowly move over time on the surface of the earth
- **crater** — a bowl-shaped opening at the top of a volcano or geyser *crust, n. Earth’s outermost layer, featuring a rocky surface
- **dense** — thick or heavy (denser) deposit, 1. v. to put or leave something in a particular place; 2. n. material laid down or left by a natural process (v. deposited, n. deposits)
- **descend** — to move downward
- **detective** — a person whose job is to find information about someone or something
- **dissolved** — mixed with liquid so no solid pieces are visible anymore

Teacher’s lesson plan

Follow the Teacher Guide, PDF pages 282–288: the steps, materials and timing for this lesson.

Read

Read Chapter 9, “Earth’s Undersea World”: PDF pages 88–124. Look at the pictures and maps together.

Talk it over

1. Seafloor spreading explains which of the following?
2. Which phrase describes the Mid-Atlantic Ridge?
3. Part B Why might these animals live near these particular seafloor features?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 14.1: Earth’s Undersea World — Activity Book, PDF pages 131–134

- Activity Page 14.2: Sequencing Multiple Adjectives — Activity Book, PDF pages 135–136
- Activity Page 14.3: Practice Suffixes -ly and -y and Roots graph and rupt — Activity Book, PDF pages 137–138
- Activity Page 14.4: Practice Spelling Words — Activity Book, PDF pages 139–140

Check for understanding

- Answer the Big Question in a sentence or two: How does the movement of tectonic plates shape and change the seafloor?
- Use one of today's words in a sentence of your own.

Lesson 15: Spelling

Words to know

- **canyon** — a deep valley with steep sides and often a stream or river flowing through it
- **evidence** — proof; information and facts that are helpful in forming a conclusion or supporting an idea
- **fault** — a crack in Earth's crust (faults) *fault-block mountains, n. mountains formed when gigantic blocks of rock move up and down along faults
- **obsidian** — a dark rock or natural glass formed from lava that cooled very quickly
- **pressure** — the weight or force produced when something presses or pushes against something else
- **school** — a large number of ocean animals of one type swimming together
- **sheet** — a broad stretch of something
- **state** — the condition of being a solid, liquid, or gas
- **tsunami** — a gigantic wave of seawater caused by an earthquake in oceanic crust
- **volcano** — a hill or mountain that forms over a crack in Earth's crust from which lava erupts (volcanoes) *weather, v. to break down into smaller pieces (n. weathering)

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 289–303: the steps, materials and timing for this lesson.

Talk it over

1. What three words are important when thinking about geology?
2. Why do people have to think about time in terms of years instead of minutes, hours, and days when thinking about geology?
3. Which rock layers in the Grand Canyon are half as old as the earth is believed to be?
4. Why is the Grand Canyon such an amazing thing for geologists to study?

Answers are at the back of this pack.

Activity Book pages

- Activity Page 15.1: Spelling Assessment — Activity Book, PDF pages 141–142
- Activity Page 15.2: Unit Assessment—Geology — Activity Book, PDF pages 143–158

Check for understanding

- Use one of today's words in a sentence of your own.

Pausing Point: Review, extra practice and answer keys

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 304–308: the steps, materials and timing for this lesson.

Activity Book pages

- Pausing Point page 1: Mid-Unit Content Assessment — Activity Book, PDF pages 159–164
- Pausing Point page 2: End-of-Unit Content Assessment — Activity Book, PDF pages 165–174
- Pausing Point page 3: Commas — Activity Book, PDF pages 175–176
- Pausing Point page 4: Commas and Quotation Marks — Activity Book, PDF pages 177–178
- Pausing Point page 5: Sequencing Adjectives — Activity Book, PDF pages 179–180
- Pausing Point page 6: -ly: Suffix Meaning “in a — Activity Book, PDF pages 181–182
- Pausing Point page 7: Root rupt — Activity Book, PDF pages 183–184
- Pausing Point page 8: Suffixes -ly and -y and Roots graph and rupt — Activity Book, PDF pages 185–194

For the teacher

- Teacher Resources (answer keys and extra materials) — Teacher Guide, PDF pages 309–368

Check for understanding

WORDS QUIZ

Geology

Name: _____ Date: _____

Circle the letter of the best answer.

1. Which word means “to move downward”?

- a) pepper
- b) descend
- c) silt
- d) scald

2. Which word means “the act of getting even for a wrongdoing *rock cycle, n. the continuous cycle in which rocks are created, destroyed, and recreated”?

- a) dwelling
- b) subduction zone
- c) revenge
- d) school

3. Which word means “a narrow, extremely deep valley formed when the seafloor dips down as one tectonic plate slides under another”?

- a) hoodoo
- b) ocean trench
- c) sea level
- d) compact

4. Which word means “something that someone takes on as a task or duty”?

- a) silt
- b) compact
- c) pyroclastic flow
- d) undertaking

5. Which word means “a platform or table used as a center of worship in religious ceremonies or services”?

- a) altar
- b) dwelling
- c) pinnacle
- d) hot spring

6. Which word means “a very hot region deep within Earth’s mantle where a huge magma chamber forms”?

- a) basalt
- b) granite
- c) hotspot
- d) information you have (concluded

7. Which word means “a crack in Earth’s crust (faults) *fault-block mountains, n. mountains formed when gigantic blocks of rock move up and down along faults”?

- a) distant
- b) fossil
- c) fault
- d) state

8. Which word means “very small sediments deposited by water”?

- a) fossil
- b) silt
- c) school
- d) heave

9. Which word means “a hollowed-out place formed by digging or carving”?

- a) excavation
- b) strong-willed
- c) durable
- d) ocean trench

10. Which word means “having a rough, uneven surface”?

- a) rugged
- b) catastrophe
- c) distant
- d) silt

11. Which word means “heavy, dense rock formed from cooled, hardened lava”?

- a) obsidian
- b) offering
- c) basalt
- d) compact

12. Which word means “the tallest kind of pinnacle”?

- a) altar
- b) hoodoo
- c) panic
- d) subduction zone

Answers

Lesson 1: Chapter 1, “Earth’s Changing Surface”

1. **What conclusions did scientists make about the history of the earth based on the evidence they observed?**

They believed that powerful natural forces were at work changing Earth’s surface; that most of these results or effects took place very slowly; and that slow gradual changes over long periods of time added up to produce dramatic results.

2. **One meaning of the word dramatic is “very noticeable.” How might the observations made by European scientists be considered dramatic results?**

Answers may vary, but should include that scientists compared observations and records made over long periods of time and noticed extreme differences when comparing information. Once-tall mountains getting smaller over time is a noticeable difference. The creation of valleys by rivers where valleys did not previously exist is a noticeable difference. Changes in sea levels are noticeable differences, given how much of Earth is water. Fossils found at the top of mountains, a place where living things likely can’t survive, is a noticeable difference.

3. **How did other scientists in the early 1900s respond to Wegener’s hypothesis?**

They criticized Wegener’s ideas and rejected his hypothesis.

4. **Why did scientists respond this way?**

Wegener had not identified how continents moved.

5. **During the 1700s and 1800s, which observations were made from evidence gathered over long periods of time that indicated Earth’s surface features do change?**

Answers may vary, but should include: evidence gathered over long periods of time showed once-tall mountains were worn down by wind, rain, and ice; valleys had been carved by rivers flowing through them; evidence of sea levels being higher and lower at different times in the past; fossils found in layers of rock on mountain peaks; big rocks gradually broke down into sediments; lava cooled and hardened.

Lesson 2: Chapter 2, “Earth’s Layers and Moving Plates”

1. **What did scientists learn from studying seismic waves?**

By studying seismic waves, scientists were able to identify Earth’s four main layers: the inner core, the outer core, the mantle, and the crust.

2. **Why did scientists suspect that ocean trenches were part of the answer to the puzzle of continental drift?**

Scientists knew the earth wasn’t getting any bigger; they guessed that if new crust was being created along mid-ocean ridges, then old crust must be destroyed somewhere else; new maps of the seafloor revealed incredibly deep valleys along the edges of several ocean basins; scientists guessed that deep ocean trenches are places where crust is sinking down into the mantle.

3. **How does the theory of plate tectonics provide an explanation for how continents can move?**

According to the theory of plate tectonics, the earth's crust and the solid top part of the mantle are broken up into huge rocky slabs called tectonic plates that fit tightly together. As the material in the mantle beneath the tectonic plates slowly moves due to heat and pressure, it exerts enormous pressure on the plates above. The pressure is great enough to cause the plates, which include continents, to move very, very slowly.

4. **What is subduction?**

Subduction is the name of the process when an oceanic plate slides under a continental plate.

Lesson 3: Chapter 2, "Earth's Layers and Moving Plates"

1. **What information in the text helps you determine whether Earth's crust is liquid or solid?**

The words rocky crust imply the crust is solid, since we know rocks are solid.

Lesson 4: Chapter 3, "Earth's Shakes and Quakes"

1. **What is a synonym for the word penned in the first sentence?**

wrote

2. **How does the author describe earthquakes here?**

The author describes earthquakes as violent natural disasters that strike without warning.

3. **What role do faults play in earthquakes?**

Faults are the places where earthquakes originate, or start from. When blocks of rock move against each other at a fault, a huge amount of built-up pressure is released as energy, traveling in all directions as seismic waves. Seismic waves shake the ground, and this event is called an earthquake.

4. **The author compares an earthquake's focus to a heart. Why do you think the author does this?**

The author compares the earthquake's focus to a heart as a way of showing that the focus is an important part of the earthquake. The focus is the source of the earthquake, where it begins. The author is showing that, in the same way a heart is an important part of the body, so important that the body could not function without it and could be considered the source of life in the body, the earthquake's focus is an important part of an earthquake, the source of the earthquake in the earth.

5. **What are two ways scientists measure the intensity of earthquakes?**

Scientists measure the intensity of earthquakes using seismographs and the Richter scale.

6. **How are earthquakes and tsunamis connected?**

An earthquake in the ocean triggers a tsunami. A tsunami forms as a result of the seafloor shifting after an earthquake in the oceanic crust that forms the seafloor.

7. **What happens beneath Earth's surface to cause earthquakes?**

At faults, huge blocks of rock get stuck against each other. Beneath Earth's surface, material in the mantle moves beneath the stuck rocks. This causes pressure to build. When the pressure builds to the point that the rocks break and slip past one another, energy is suddenly released. The energy travels through the earth as seismic waves. These waves cause an earthquake, which is evident when the ground shakes.

Lesson 5: Chapter 3, "Earth's Shakes and Quakes"

1. **How much energy is released when blocks of rock that were stuck break and slip past each other?**

All the energy that accumulated in the rocks during the time they were stuck and couldn't move is released.

2. **How is a seismograph different from the Richter scale?**

A seismograph produces wiggly lines to show the energy of seismic waves. The Richter scale applies numbers to measure the magnitude of an earthquake based on the largest seismic wave recorded.

Lesson 6: Chapter 4, "Earth's Fiery Volcanoes"

1. **According to the text, what are some ways erupting volcanoes can change Earth's surface?**

Answers may vary, but should include: add new land to Earth's surface; bring minerals from deep inside the earth to the surface; flatten entire forests; release rivers of lava that can burn and bury everything in their path; and trigger earthquakes, tsunamis, and landslides.

2. **What are the differences between active, dormant, and extinct volcanoes?**

Active volcanoes are ones that have erupted in the past 10,000 years and that will likely erupt again. Dormant volcanoes are active volcanoes that haven't erupted in a long time. Extinct volcanoes are ones that have not erupted for at least 10,000 years.

3. **How does an undersea volcano become a chain of islands?**

Magma erupts from a hotspot underneath oceanic crust, forming a volcano on the seafloor. With repeated eruptions, the volcano grows over time until it rises above the ocean's surface, forming an island. Over time, tectonic plates move and the island moves with them. The hotspot stays in the same place, so the process begins again, resulting in multiple islands.

4. **What happens both above and below Earth's surface to form geysers?**

Above Earth's surface, water drains down into openings in the ground above the magma chamber. Below Earth's surface, heat from the magma turns the water scalding hot. As the hot water rises back up through the openings below Earth's surface, it turns into steam, which increases the pressure, forcing the mixture of steam and hot water rushing and bubbling upward. Then it explodes out of the ground and above Earth's surface as a hissing fountain of hot water and steam.

Lesson 7: Chapter 5, "Mythic Volcano Spirits"

1. **What is a synonym for the word spirits as it is used in this context?**
gods; supernatural forces
2. **According to the text, how did people make sense of volcanic eruptions?**
People believed volcano gods lived inside volcanoes; when they were angry, volcanoes erupted and when they were content, volcanoes were quiet.
3. **What natural occurrence is being explained in this passage?**
The creation of volcanoes on the Hawaiian Island chain is being explained in this passage. Each time Pele moves to a new island to get away from her sister, she creates a volcano to live in, which creates a new island.
4. **What events are being depicted in the images on these pages? How do you know?**
The first image depicts the struggle between Pele and Na-maka-o-kaha'i. You can tell they are fighting by the way they are using their arms and by the way they are standing. Also, the colors used for what they are wearing and for what is beneath each of them, lava or water, helps you understand what is happening. The second image depicts Pele sending her sister, Hi'iaka, to fetch her husband-to-be from Kauai. Again, colors are used to show each person. Each sister in these images wears a different color (Pele wears red/orange, Na-maka-okaha'i wears blue, and Hi'iaka wears green).
5. **What volcanic activity does this passage explain?**
This passage explains a volcanic eruption.
6. **What volcanic feature does this passage explain?**
It explains how a caldera formed at the top of Kilauea.
7. **How do scientists think Crater Lake was formed?**
Crater Lake is a deep, nearly circular lake that fills the large caldera of the dormant Mount Mazama. A caldera is a kind of crater. Over time, rain and melted snow filled the caldera, creating a lake.
8. **What volcanic activity is explained in this passage?**
A volcanic eruption is explained in this passage.

Lesson 8: Chapter 6, "Earth's Building Blocks"

1. **What are rocks?**
Rocks are naturally occurring materials made of solid, nonliving substances called minerals.
2. **How does igneous rock form?**
Igneous rock forms when magma cools and solidifies.
3. **How does sedimentary rock form?**
Sedimentary rock forms when, over time, sediments collect in layers, are bound together by solid minerals, and are compacted and cemented together.

Lesson 10: Chapter 7, "Earth's Powerful Forces of Change"

1. **How does wind cause weathering and erosion?**
Wind picks up sediments and carries them away, depositing them on land or in water.

2. **How are sediments and sedimentary rock related?**

Sedimentary rock is made of sediments. Over time, sediments are compacted and cemented together, layer by layer, transforming them into sedimentary rock.

3. **Based on the information in the text, how does the amount of flowing water affect the type of sediments that are eroded?**

The more moving water there is, the larger the sediments and rocks that are moved. A summer rain does not include much water so the sediments it moves are small. A rushing mountain stream has more water than a summer rain and moves faster so it can move small stones into a valley at the bottom of the mountain. A flooded river is overflowing with fast-moving water that is strong enough to move large rocks farther down the river.

4. **What is one example or piece of evidence provided on these pages that weathering, erosion, and time work together to change Earth's surface?**

Answers may vary, but should include: Over time, the Grand Canyon was created by wind, rain, and the Colorado River working together to cut and shape the landscape. Over time, weathering and erosion wore down the Appalachian Mountains, which are not as tall as they once were.

Lesson 12: Chapter 8, "Earth's Mighty Mountains"

1. **What role have tectonic plates had in changing Earth's features?**

Tectonic plates have dramatically changed Earth's features over many millions of years, so tectonic plates have had a major role in changing Earth's features.

2. **What evidence in the text supports this role?**

plate movements have shuffled Earth's continents into different positions; they have destroyed old oceans and created new ones; they have also built mountains and mountain ranges in several different ways

3. **According to the text, how are fold mountains formed?**

Tectonic plates collide, pushing continental crust together with so much pressure that the crust crumples. The rocky crust gets pushed upward, creating folds.

4. **What are some common features of fold mountains?**

Answers may vary, but should include: fold mountains contain quite a bit of sedimentary rock; they look like folds of rock.

5. **How are fault-block mountains formed?**

Fault-block mountains form when gigantic blocks of rock move up and down along faults.

6. **What are some common features of faultblock mountains mentioned in the text?**

Fault-block mountains typically have one steep side and one sloping side; the steep side of fault-block mountains form high cliffs.

7. **According to the text, how are dome mountains formed?**

Some dome mountains form when magma pushes upward into Earth's crust from the mantle. The magma cools into igneous rock before reaching the surface. The igneous

rock causes the crust to bulge.

8. **What are some common features of dome mountains?**

Dome mountains look like great humps of rock with rounded tops; they don't have sharp, jagged peaks; they usually occur as isolated mountains on otherwise flat plains.

Lesson 13: Chapter 9, "Earth's Undersea World"

1. **What is seafloor spreading?**

Seafloor spreading is the process of oceanic plates moving apart very slowly. As the seafloor spreads, the continents on either side of the Atlantic are pushed farther apart.

2. **Why is the chain of mid-ocean ridges the most volcanically active mountain range in the world?**

Volcanoes form where there are cracks and weak spots in Earth's crust, which is mostly along tectonic plate boundaries. Mid-ocean ridges are found wherever tectonic plates are slowly moving apart. Because the chain of mid-ocean ridges makes up the world's longest mountain range, this also means it has the most cracks or weak spots in Earth's crust of any mountain range, making it the most volcanically active mountain range in the world.

3. **How are they formed?**

They form when water seeps through cracks in the oceanic crust and is heated by the hot magma below. The very high temperatures heat the water and force it back up through the cracks in an explosion of water and minerals.

4. **What is an ocean trench?**

An ocean trench is a narrow, extremely deep valley where the seafloor dips down as one plate slides under another along a subduction zone.

5. **Why have only three people traveled to the bottom of the Mariana Trench?**

It is the deepest ocean trench, which means it takes a very long time to reach the bottom. In addition, it is pitch black, the water temperature is around freezing, and the water pressure is very high, all of which create a challenging environment to send submersibles or robot vehicles into.

Lesson 14: Chapter 9, "Earth's Undersea World"

1. **Seafloor spreading explains which of the following?**

E. A and B only

2. **Which phrase describes the Mid-Atlantic Ridge?**

B. a long, rugged underwater mountain range

3. **Part B Why might these animals live near these particular seafloor features?**

Answers may vary, but could include: animals may live near these features because of the tiny, single-celled organisms that grow there as a result of the nutrients brought up by seamounts.

Lesson 15: Spelling

1. **What three words are important when thinking about geology?**
heat, pressure, and time
2. **Why do people have to think about time in terms of years instead of minutes, hours, and days when thinking about geology?**
Heat and pressure take a long time to change the earth in ways that geologists can find evidence of. If you think about time in minutes, hours, and days, it is unlikely that evidence of change will be detected because geological changes happen so very slowly.
3. **Which rock layers in the Grand Canyon are half as old as the earth is believed to be?**
the rock layers at the very bottom of the canyon
4. **Why is the Grand Canyon such an amazing thing for geologists to study?**
There are many rock layers in the Grand Canyon and each layer provides clues about the earth's formation and history, giving geologists a lot to study and a lot of information to help shape people's understanding of how the earth formed and how it changes.

Unit quiz key

1. b 2. c 3. b 4. d 5. a 6. c 7. c 8. b 9. a 10. a 11. c 12. b