STUDENT ADVENTURE GUIDE

EARTH SCIENCE EXPLORED

elementary

Luke & Trisha Gilkerson

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Earth Science Explored Elementary: Student Adventure Guide

Journey Homeschool Academy

INTRODUCTION

Make no mistake, Earth science is more than just rocks. As your students dive into this course, they'll discover the power behind volcanoes, earthquakes, and tsunamis. They'll journey into the heart of a cave to uncover its mysteries. They'll examine why we have seasons, how we can predict the weather, where fossils came from, and much more!

Your students will be amazed as they uncover the majesty of God's creation. We hope their senses will be captivated so they'll be encouraged to continue their exploration of the world around them.

In addition to the online video course, this companion volume guides students through their study of the earth. Parents can choose which activities they want to incorporate. After watching each video lesson, parents can...

- Choose books from the reading lists (either to read aloud or assign as independent reading).
- Assign copywork to practice handwriting skills—and learn interesting quotes about the earth from the Bible and famous scientists.
- Help their child with hands-on learning activities that will make the lesson come to life!
- Give their kids a short quiz to test what they learned from the lesson.

The lesson cards, used to assist your child in memorizing important facts about Earth science, are sold separately or you may download them as a pdf, included as part of the course.

CONTENTS

HOME SWEET HOME

We study this planet we call home, the earth, because of how special it is. No other planet in the solar system is like it. Psalm 115:16 says, "The heavens are the LORD's heavens, but the earth he has given to the children of man." The earth is God's gift to us to explore, to understand, and to rule wisely.

Recommended Reading

- *The Goldilocks Zone*, by Drew Sheneman
- *Just Right: Searching for the Goldilocks Planet*, by Curtis Manley
- *What's So Special About Planet Earth?*, by Robert E. Wells
- *Your Place in the Universe*, by Jason Chin
- *Scientists Who Changed History*, by DK, p. 46: Copernicus
- *Scientists: Inspiring Tales of the World's Brightest Scientific Minds*, by Isabel Thomas, pp. 116-117: Copernicus

ACTIVITY Where Is the Habitable Zone?

The habitable zone is the distance from a star at which liquid water could exist on a planet. But where is this zone around our star, the sun? This activity will demonstrate where this zone lies.

SUPPLY LIST

- Basketball
- Playdough
- Two board game tokens
- Ruler
- Tape measure

INSTRUCTIONS

1. Using the playdough, create three small balls. Two balls should be a little less than ⅛ inch in diameter. (One will represent Venus; the other will represent Earth.) One ball should be a little less than 1/16 inch in diameter. (This will represent Mars.)
2. Place the three small playdough planets next to the basketball, which represents the sun. Note how much smaller they are compared to the ball.
3. Place the basketball down at the end of a large yard or long sidewalk.
4. Measure 62 feet away from the basketball. Place playdough Venus there.
5. Walk 19½ feet further from Venus. Place the first game token there.
6. Walk 4½ feet further from the token. Place playdough Earth there.
7. Walk 31½ feet further from Earth. Place the second game token there.
8. Walk 12½ feet further from the token. Place playdough Mars there.

QUESTIONS

The habitable zone starts about 88 million miles from the sun, and it ends about 127 million miles from the sun. Where the habitable zone starts and stops is represented by the two game tokens. Where is playdough Earth compared to the tokens?

_____

_____

Where are Venus and Mars compared to the game tokens?

_____

_____

LESSON 1: ISAAC NEWTON

Gravity explains the motions of the planets, but it cannot explain who sets the planets in motion.

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Lesson 1 Quiz

1. **What is the shape of Planet Earth?**

   A) Sphere
   B) Cube
   C) Triangular
   D) None of the above

2. **The earth is the center of the universe, and it has a giant star, the sun, which travels around it.**

   A) True
   B) False

3. **What is the force that attracts an object to another object called?**

   A) Gravity
   B) Atmosphere
   C) Object force
   D) Attraction

4. **The habitable zone is:**

   A) the parts of a planet that has water
   B) the planets in our solar system that have different types of rock features
   C) the distance from a star where liquid water can exist on a planet
   D) the region of a planet where people build their homes

5. **The system the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune are part of is called the:**

   A) Milky Way system
   B) regional system
   C) planet system
   D) solar system

6. **Earth is home to millions of different types of living things.**

   A) True
   B) False

7. **Earth is the only planet in the solar system with:**

   A) volcanoes
   B) liquid water
   C) rocks
   D) an atmosphere

2 THE SPHERES OF THE EARTH

When you study Earth science, you're studying each of the four spheres of the earth—each one distinct yet all interacting with one another. Join us on our adventure as we uncover the mysteries of the geosphere, hydrosphere, atmosphere, and biosphere!

Recommended Reading

- *The Earth and Sky*, by Gallimard Jeunesse and Jean-Pierre Verdet
- *The Four Spheres of Earth*, by Paul Larson

ACTIVITY Exploring the Spheres of the Earth

The geosphere, hydrosphere, atmosphere, and biosphere are unique spheres of the earth that are constantly interacting with one another. In this activity, you'll spend some time exploring each sphere and considering how each one affects and interacts with the others.

DEFINE THE TERMS

The geosphere is made up of _____

The atmosphere is made up of _____

The hydrosphere is made up of _____

The biosphere is made up of _____

INSTRUCTIONS

Color the geosphere, atmosphere, hydrosphere, and biosphere different colors, and fill in the key below to show what color you used for each of the spheres.

PICTURE KEY:

- ◯ Geosphere
- ◯ Atmosphere
- ◯ Hydrosphere
- ◯ Biosphere

QUESTIONS

You are a living creature, so you're part of the biosphere. You need things from each of the other spheres to survive. Give an example or two of what you need to survive and which sphere it's related to.

_____

_____

Can you think of any ways that plants, part of the biosphere, interact with other spheres?

_____

_____

When rain falls from the clouds, what spheres are involved?

_____

_____

LESSON 2: PSALM 115:16

The heavens are the Lord's heavens, but the earth He has given to the children of man.

LESSON 2: PSALM 115:16

The heavens are the Lord's heavens, but the earth He has given to the children of man.

Lesson 2 Quiz

1. Which sphere is made up of all of the earth's water?

A) Geosphere
B) Hydrosphere
C) Biosphere
D) Atmosphere

2. Which sphere contains all the air that is around the earth?

A) Geosphere
B) Hydrosphere
C) Biosphere
D) Atmosphere

3. The earth is one big, solid sphere.

A) True
B) False

4. Which sphere contains the earth's ground, including the soil, minerals, and rocks?

A) Geosphere
B) Hydrosphere
C) Biosphere
D) Atmosphere

5. Which sphere contains all the living things on Earth?

A) Geosphere
B) Hydrosphere
C) Biosphere
D) Atmosphere

6. Where is most of the water on Earth located?

A) Ponds
B) Rivers
C) Lakes
D) Oceans

7. The atmosphere is made up of:

A) solids
B) liquids
C) gases

8. Bio means:

A) Earth
B) life
C) water
D) wind

9. The geosphere is:

A) in outer space
B) under our feet
C) over our heads
D) in the ocean

MY PLACE IN THIS WORLD

If you know how to use a map, you might be able to find buried treasure. But more likely, you'll be able to use these skills to find various locations you might need to travel. In this lesson, you'll be learning about the four cardinal directions along with special lines on the map called longitude and latitude.

Recommended Reading

- *The Discovery of Longitude*, by Joan Marie Galat
- *Follow that Map! A First Book of Mapping Skills*, by Scot Ritchie
- *How to Go Anywhere (and Not Get Lost)*, by Hans Aschim

ACTIVITY Adventures in Mapping

In the first activity for this lesson, you'll become better acquainted with the world map as you locate many of the landmarks we talked about in today's lesson. In the second activity, you'll learn how longitude and latitude lines allow you to plot coordinates.

Get To Know the Map

SUPPLIES

- Pencil
- Globe or other resource for locating continents

INSTRUCTIONS

1. On the world map on the following page, locate and label the following:
   - Equator
   - Prime meridian
   - The cardinal directions: north, south, east, and west
2. Use a globe or other resource and find the seven continents. Label each of the seven continents on your map.

ACTIVITY Beginner Coordinates Puzzle

SUPPLIES

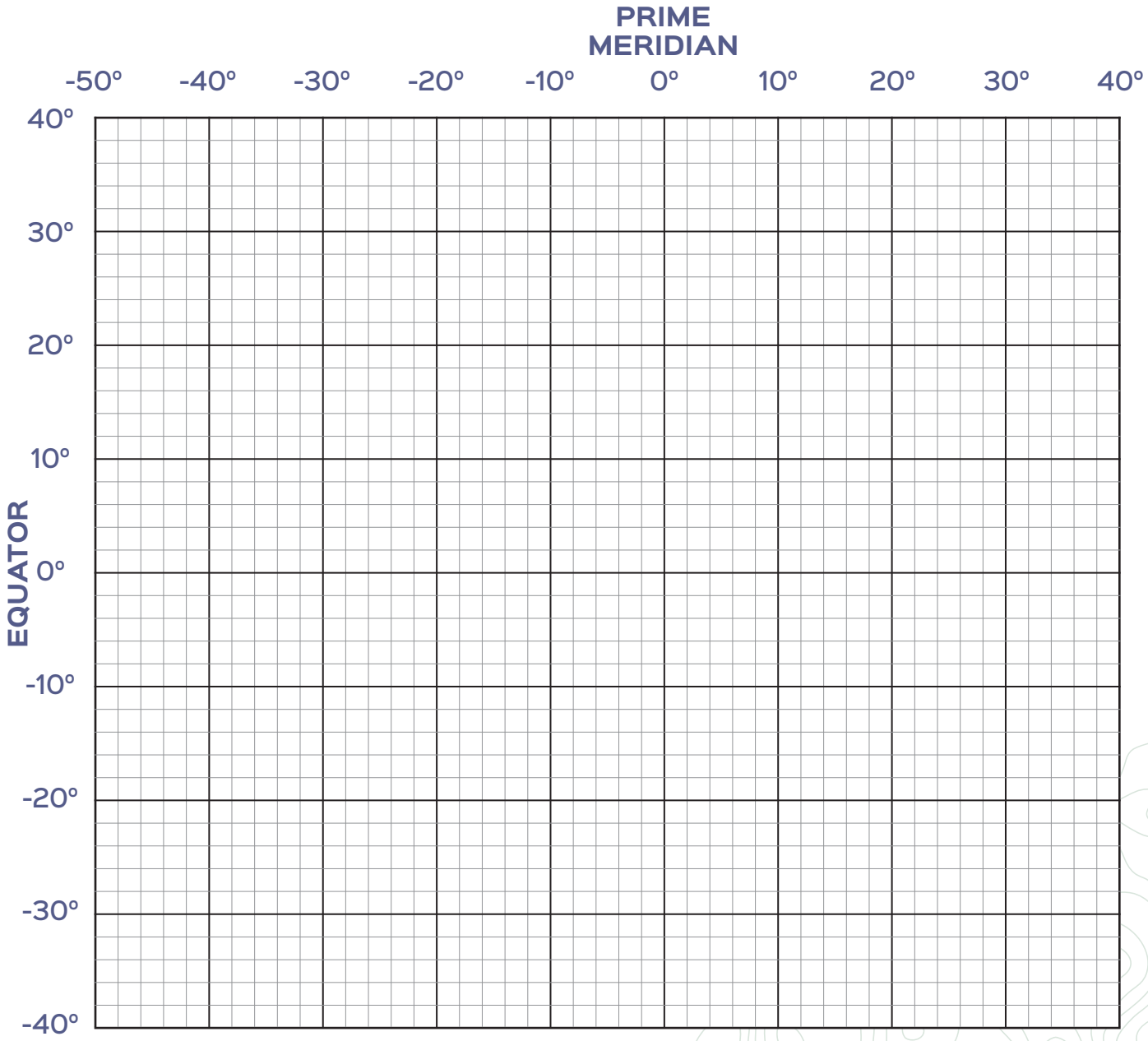
- Pencil
- Ruler

INSTRUCTIONS

1. Below are a series of coordinates you can find on the longitude and latitude grid. Plot each of the coordinates below by placing a dot on the grid.
2. Be sure to plot the coordinates in order, and then use a ruler to draw a line connecting one dot to the next one.
3. Once you have completed the picture, color or decorate your page. Share with us on Facebook, Instagram, or by email so we can see your creation!

COORDINATES

1. 30° N, 0°
2. 10° N, 10° E
3. 0°, 30° E
4. -10° S, 10° E
5. -30° S, 20° E
6. -20° S, 0°
7. -30° S, -20° W
8. -10° S, -10° W
9. 0°, -30° W
10. 10° N, -10° W
11. 30° N, 0°


PRIME MERIDIAN
-50°
-40°
-30°
-20°
-10°
0°
10°
20°
30°
40°
40°
30°
20°
10°
EQUATOR
0°
-10°
-20°
-30°
-40°

ACTIVITY Challenge Coordinates Puzzle

If you were able to easily complete the beginner coordinate puzzle, get ready to challenge yourself with the puzzle below!

SUPPLIES

- Pencil
- Ruler

INSTRUCTIONS

1. Below are a series of coordinates you can find on the longitude and latitude grid. In the challenge puzzle there are six parts.
2. Plot each of the coordinates in Part 1 by placing a dot on the grid.
3. Be sure to plot the coordinates in order, and then use a ruler to draw a line connecting one dot to the next one.
4. On the same grid, plot and draw lines between the dots for each of the coordinates in Part 2.
5. Continue until you've completed all six parts.
6. Once you have completed the picture, color or decorate your page. Share with us on Facebook, Instagram, or by email so we can see your creation!

COORDINATES

Part 1:

1. 30° N, 0°
2. 10° N, 6° E
3. 6° N, 10° E
4. 0°, 30° E
5. -6° S, 10° E
6. -10° S, 6° E
7. -30° S, 0°
8. -10° S, -6° W
9. -6° S, -10° W
10. 0°, -30° W
11. 6°N, -10° W
12. 10°N, -6° W
13. 30°N, 0°

Part 2:

1. 10° N, -6°W
2. 12° N, -4°W
3. 12°N, 4°E
4. 10°N, -6°W
5. 6° N, 10° E
6. 4° N, 12° E
7. -4° S, 12° E
8. -6° S, 10° E
9. -10° S, 6° E
10. -12° S, 4° E
11. -12° S, -4° W
12. -10° S, -6° W
13. -6° S, -10°W
14. -4°S, -12°W
15. 4°N, -12°W
16. 6°N, -10°W
17. 10°N, -6°W

Part 3:

1. 30° N, -4° W
2. 40° N, -4° W
3. 30° N, 4° E
4. 40° N, 4° E

Part 4:

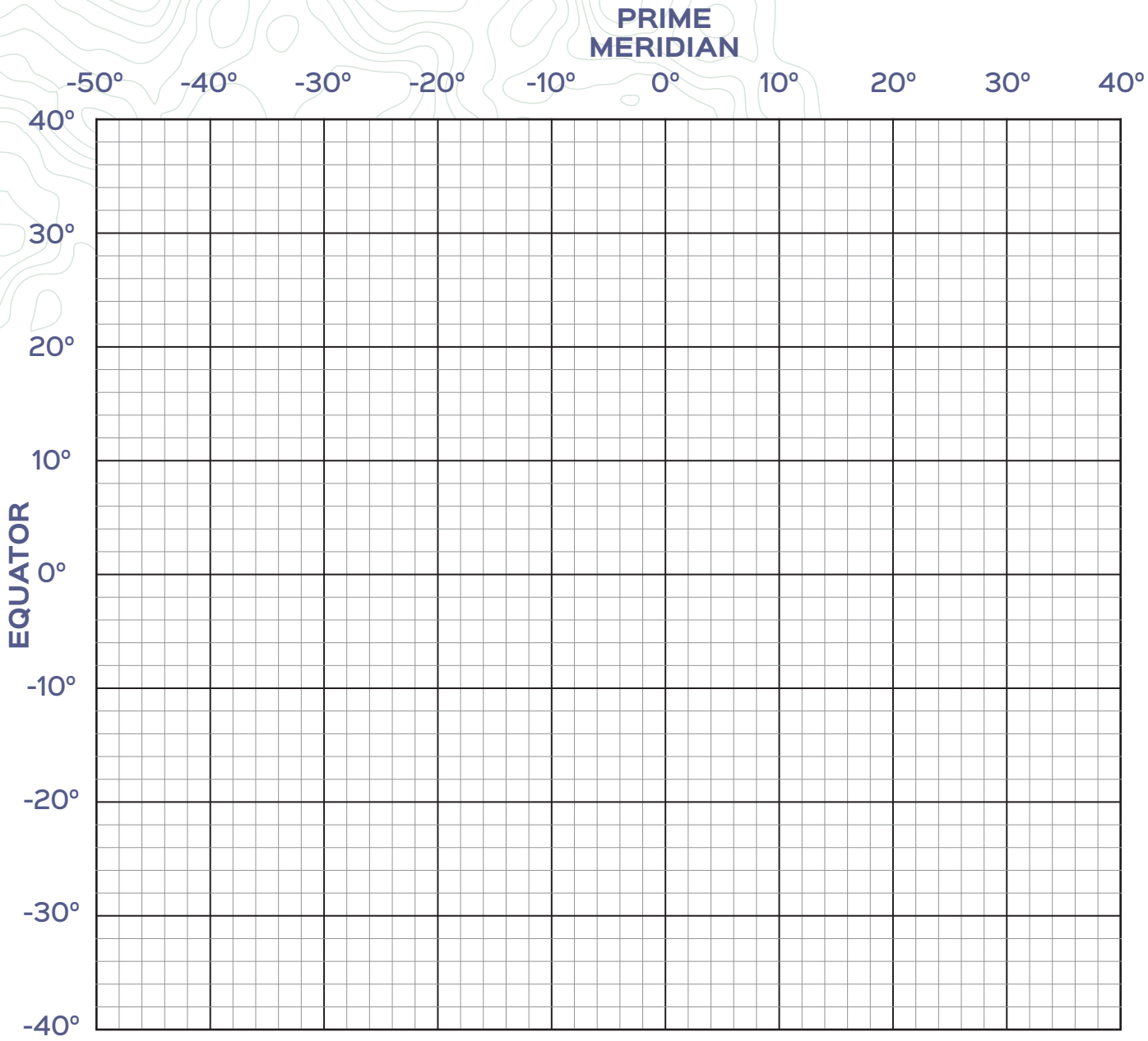
1. 6° N, 40° E
2. 6° N, 32° E
3. 0°, 32° E
4. 0°, 36° E
5. 0°, 32° E
6. -6° S, 32° E
7. -6° S, 40° E

Part 5:

1. -34° S, 2° E
2. -32° S, 2° E
3. -32° S, -4° W
4. -34° S, -4° W
5. -38° S, 2° E
6. -40° S, 2° E
7. -40° S, -4° W
8. -38° S, -4° W

Part 6:

1. 4° N, -44° W
2. -4° S, -42° W
3. 0°, -38° W
4. -4° S, -34° W
5. 4° N, -32° W


PRIME MERIDIAN
-50°
-40°
-30°
-20°
-10°
0°
10°
20°
30°
40°
EQUATOR
40°
30°
20°
10°
0°
-10°
-20°
-30°
-40°

LESSON 3: PSALM 103:12

As far as the east is from the west, so far does

He remove our transgressions from us.

LESSON 3: PSALM 103:12

As far as the east is from the west, so far does He remove our transgressions from us.

Lesson 3 Quiz

1. **These lines run north to south and are also called meridians:**

   A) westerlies
   B) parallel lines
   C) latitude lines
   D) longitude lines

2. **What are the lines on a map that run east to west that are also called parallels?**

   A) Westerlies
   B) Parallel lines
   C) Latitude lines
   D) Longitude lines

3. **The earth spins around on an invisible line called an axis.**

   A) True
   B) False

4. **The four cardinal directions are:**

   A) up, down, right, left
   B) northeast, northwest, southeast, southwest
   C) north, south, east, west
   D) forward, backwards, up, down

5. **Flat maps of the earth correctly show the size of countries.**

   A) True
   B) False

6. This line is halfway between the North and South Poles:

A) the equator
B) horse latitude
C) central latitude
D) the prime meridian

7. Which line divides the Eastern and Western Hemispheres?

A) The equator
B) Horse latitude
C) Central latitude
D) The prime meridian

4 FEELING DIZZY

Can you imagine living in a time where no clocks or calendars existed? How would you know what to do and when? Long ago, people lived without clocks and calendars. In this lesson, you'll discover how humans began to use the lights in the sky to determine the rhythms of hours, days, weeks, and months.

Recommended Reading

- *Earth Cycles,* by Michael Elsohn Ross
- *You Wouldn't Want to Live Without Clocks and Calendars!,* by Fiona Macdonald

ACTIVITY Dizzy Planet

In the first activity for this lesson, you'll literally get to "feel" what it's like to be the earth. In the second activity, you'll have a chance to explore the differences between what it means for the earth to revolve and for the earth to rotate.

Rotation & Revolution Simulation

SUPPLIES

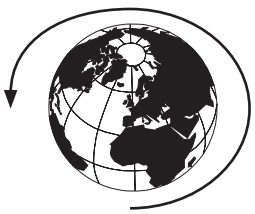
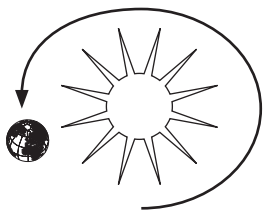
- Your body
- A friend, parent, or sibling

INSTRUCTIONS

1. Have your friend, parent, or sibling stand still in the middle of a room. Stand about 4-5 feet away from them. This person represents the sun. You represent the earth.
2. First, practice rotating on your "axis:" stand still in one place and spin around counterclockwise (to the left). Each time you are facing the other person, say "Daytime!" When you are facing away from the other person, say "Nighttime!" Do this over and over at least 10 times.
3. Second, practice revolving around the person, staying in the same "orbit"—the same distance away as you move in a circle around them counterclockwise. When you pass by the place you started, say, "Year 1!" When you pass by it again, say, "Year 2!" Do this at least 10 times.
4. Third, put these motions together! Rotate around while you also revolve around your partner. If you really want to have fun, say "Daytime," "Nighttime" and call out the years just like you did in the last two steps. Do this until you get completely dizzy.

Rotation & Revolution Comparison

Cut out the cards below. Paste them on the next page in the correct column.

TO SPIN AROUND A CENTER	ORBIT: THE PATH THE EARTH MOVES AROUND THE SUN
CAUSES THE SUNRISE AND SUNSET	TO MOVE AROUND ANOTHER OBJECT
AXIS: THE IMAGINARY LINE THE EARTH SPINS AROUND	CAUSES THE CYCLE OF DAY AND NIGHT
CAUSES SEASONS	TAKES 24 HOURS TO COMPLETE
TAKES ABOUT 365 DAYS TO COMPLETE	CAUSES THE CYCLE OF THE YEAR
	

Rotation & Revolution Comparison

ROTATE	REVOLVE

LESSON 4: GENESIS 1:14

And God said, "Let there be lights in the expanse of the heavens to separate the day from the night. And let them be for signs and for seasons, and for days and years.

LESSON 4: GENESIS 1:14

And God said, "Let there be lights in the expanse of the heavens to separate the day from the night. And let them be for signs and for seasons, and for days and years.

LESSON 4: GENESIS 1:14

Lesson 4 Quiz

1. **How long does it take for the earth to spin one time on its axis?**

   A) A month
   B) A year
   C) A day
   D) A week

2. **A year is how long it takes for the earth to revolve around the sun one time.**

   A) True
   B) False

3. **The Egyptians and Greeks started dividing the day into smaller units called:**

   A) hours
   B) minutes
   C) months
   D) weeks

4. **The world follows a five-day week.**

   A) True
   B) False

5. **Months are based on:**

   A) seasons
   B) ocean tides
   C) moon phases
   D) day length

6. **How many hours are in a day?**

A) 12
B) 14
C) 7
D) 24

7. **How many days are in a week?**

A) 12
B) 14
C) 7
D) 24

8. **How many months are in a year?**

A) 12
B) 14
C) 7
D) 24

5 A SEASON FOR EVERYTHING

Why do we have seasons? Why do some places go through winter, spring, summer, and fall, and other places have rainy and dry seasons? The key to understanding why we have seasons can be found in the earth's axis.

Recommended Reading

- *On Earth,* by G. Brian Karas
- *Sunshine Makes the Seasons,* by Franklyn Branley
- *The Reasons for the Seasons,* by Gail Gibbons

ACTIVITY Why Do We Have Seasons?

In this lesson, you learned about how the solstices and equinoxes relate to the seasons we experience on Earth. In this activity, you'll be creating a diagram so you can visualize these relationships.

SUPPLIES

- Scissors
- Pencil

INSTRUCTIONS

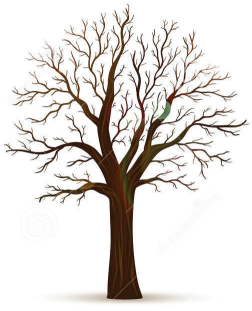
1. On the lines next to each Earth image, label the solstices and the equinoxes. Use the following labels:
   - June solstice
   - December solstice
   - March equinox
   - September equinox
2. Write the date each solstice and equinox occurs. You can find these in the lesson video or look up the dates online.
3. Cut out the pictures of the seasons and place them next to the picture of the earth they correspond with for your area of the earth. (Depending on whether you live in the Northern or Southern Hemisphere, you will experience winter, spring, summer, and fall during different months of the year.)
4. Answer the question below. Then use the diagram to tell a friend or family member what you've learned about why we experience different seasons.

Why do we experience seasons? Explain in your own words.

_____

_____

_____

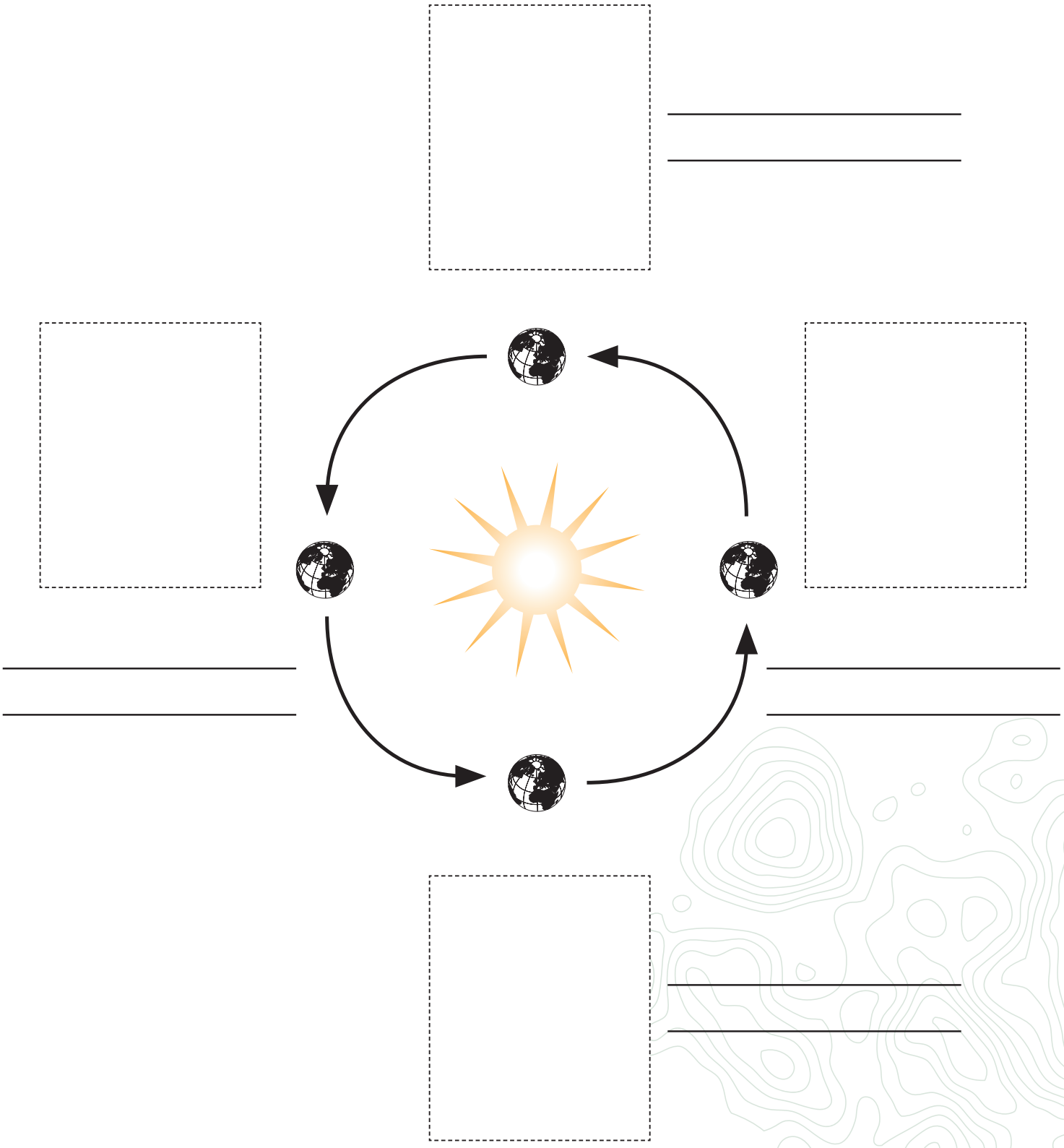


Winter

Summer

Spring

Fall



LESSON 5: GENESIS 8:22

While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night, shall not cease.

LESSON 5: GENESIS 8:22

While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night, shall not cease.

LESSON 5: GENESIS 8:22

Lesson 5 Quiz

1. **When it is winter in the Northern Hemisphere, what season is it in the Southern Hemisphere?**

   A) Spring
   B) Summer
   C) Fall
   D) Winter

2. **The earth's axis is always tilted the same way.**

   A) True
   B) False

3. **When either the Northern or Southern Hemispheres are tilted as much toward the sun as it will get, these days are called:**

   A) leap days
   B) equinoxes
   C) latitudes
   D) solstices

4. **Which days mark when there is an equal amount of daylight and nighttime?**

   A) Leap day
   B) Equinoxes
   C) Latitudes
   D) Solstices

5. **In between the Tropic of Cancer and the Tropic of Capricorn, it is cold all year long.**

   A) True
   B) False

6. What is the line between light and dark on the earth called?

A) The terminator
B) The line of light
C) Daybreak
D) Night line

7. In these places, the sun doesn't rise for about 30 days in the winter:

A) Tropic of Cancer and Capricorn
B) countries on the equator
C) Southern Hemisphere
D) Arctic and Antarctic Circles

8. What are the areas between the tropics and arctic areas called?

A) Desert zones
B) Rainforest zones
C) Temperate zones
D) Frigid zones

9. What gives us seasons?

A) The tilt of Earth's axis
B) The movement of the sun
C) The phase of the moon
D) The wind

LIFE EVERYWHERE!

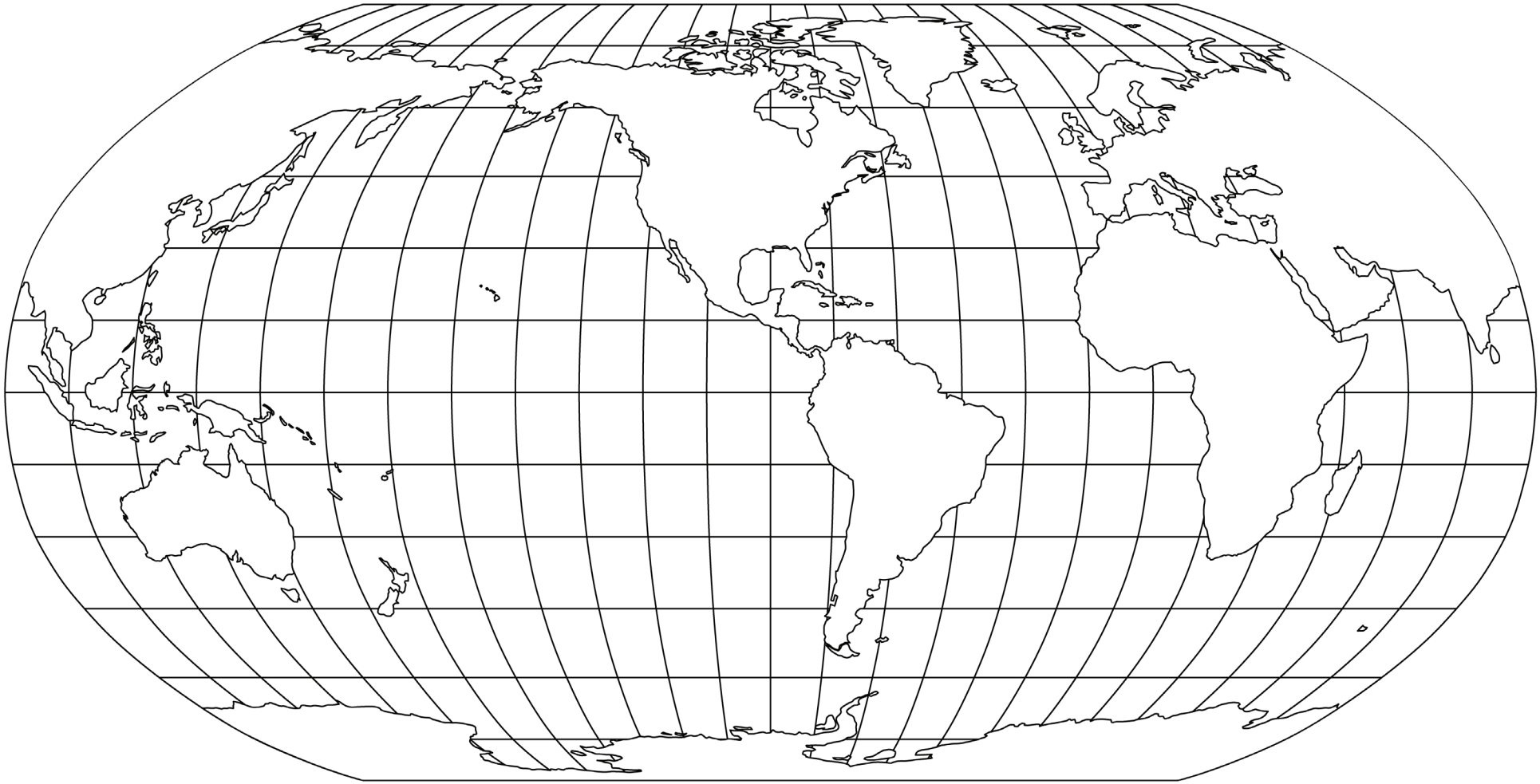
Travel the world and you'll see there is radically different weather from place to place. Why is that? It all has to do with climate zones: areas where general trends in weather stay the same over a long period of time. This lesson explores the different climate zones we find on Earth and what kinds of conditions we find in those places.

Recommended Reading

- *Beastly Biomes*, by Carly Allen-Fletcher
- *Many Biomes, One Earth*, by James Needham
- *Seasons*, by Hannah Pang

INSTRUCTIONS

Follow along on lesson 6 and shade each of the five climate zones.



Color Key

Tropic *Subtropic* *Temperate* *Polar* *Subpolar*

ACTIVITY A Climate for Every Creature

No matter what climate you live in, you will find creatures are perfectly suited for that climate—creatures that live nowhere else on Earth. For this activity, you'll study one living thing found in your climate that is found almost nowhere else in the world.

SUPPLIES

- Colored map from lesson 6
- Posterboard
- Craft supplies (markers, colored pencils, paper, etc.)

INSTRUCTIONS

1. Using the map you colored from lesson 6, with the help of an adult, place a dot on the map where you live. Observe which climate zone you live in.
2. Choose one animal that lives in your climate zone that isn't typically found in any other zone. Below are some possibilities:

    a. Tropical
        - Macaw
        - Orangutan
        - Sloth
        - Giant forest ant

    b. Subtropical
        - American alligator
        - Desert tortoise
        - Meerkat
        - Gila monster

    c. Temperate
        - Sitka blacktail deer
        - Columbian ground squirrel
        - Rocky Mountain goat
        - European bison

d. Subpolar
    - Reindeer
    - Woodland caribou
    - Mountain hare
    - Russian wolf

e. Polar
    - Muskox
    - Collared lemming
    - Beluga whale
    - Adelie penguin

3. Using books or online articles, research that animal, learning as many interesting facts about it as you can. For example, consider the following questions:

    a. What does the animal eat?
    b. What are the animal's predators?
    c. How many of that animal exist on Earth?
    d. What features of that animal make it well suited to live in its climate zone?
    e. What are fun or interesting facts about that animal?

4. Using images you cut out, print, or draw, create a poster showing what you've learned about that animal. Include on the poster a map of where the animal lives.

LESSON 6: PSALM 89:12

The north and the south, you have created them; Tabor and Hermon joyously praise your name.

LESSON 6: PSALM 89:12

The north and the south, you have created them; Tabor and Hermon joyously praise your name.

Lesson 6 Quiz

1. **The climate you live in changes from one day to the next.**

   A) True
   B) False

2. **The further away from the equator you move, the climate gets:**

   A) hotter
   B) wetter
   C) dryer
   D) colder

3. **How many climate zones are there on the earth?**

   A) 2
   B) 10
   C) 5
   D) 12

4. **Which climate zone has both rainforests and grasslands?**

   A) Tropical
   B) Polar
   C) Temperate
   D) Subpolar

5. **The subtropical zone receives _____ rain than/as the tropical zone.**

   A) more
   B) less
   C) the same amount of
   D) sometimes more and sometimes less

6. **Which climate zone experiences four distinct seasons?**

A) Polar
B) Tropical
C) Subtropical
D) Temperate

7. **Which climate zone has cool summers and long, cold winters?**

A) Temperate
B) Subtropical
C) Subpolar
D) Tropical

8. **Which climate zone has large areas of frozen soil called permafrost?**

A) Subpolar
B) Polar
C) Subtropical
D) Temperate

9. **How close an area is to water can affect its climate.**

A) True
B) False

UP, UP, & AWAY

The earth's atmosphere is a magnificent place—from the power of lightning, to the beauty of auroras. In this lesson, you'll learn the functions of the earth's atmosphere and about each of its layers.

Recommended Reading

- *The Skies Above My Eyes*, by Charlotte Guillain and Yuval Zommer
- *Weather*, by Rebecca Rupp, Chapter 1
- *Looking into the Atmosphere*, by Martha London

ACTIVITY Atmosphere Mobile

In this activity, you'll have the opportunity to visualize the layers of the atmosphere. You'll see how the atmosphere thins—the number of molecules of gases decreases—as you move from the troposphere near the earth, up to the thermosphere.

SUPPLIES

- 4 paper plates
- 3 colors of stickers, dot paints, or markers
- String
- Hole puncher

INSTRUCTIONS

1. Each paper plate will represent one layer of the atmosphere. Cut out the words on the following pages and label each paper plate.
2. Cut out the objects representing an airplane, rain cloud, satellite, and meteor. Paste these on the same side of the paper plate, showing the layer of the atmosphere where you would see these objects.
3. Older students may want to write a fun fact or two about each of the layers of the atmosphere on this side of the paper plate.
4. Punch a hole at the top and bottom of each paper plate. String the plates together in the correct order starting with the top layer of the atmosphere at the top of your mobile.
5. Using three different colors of stickers, dot paints, or markers, show the relative number of molecules of gases in each layer of the atmosphere on the opposite side of your paper plates. One color should represent nitrogen, one color should represent oxygen, and one color should represent other gases.

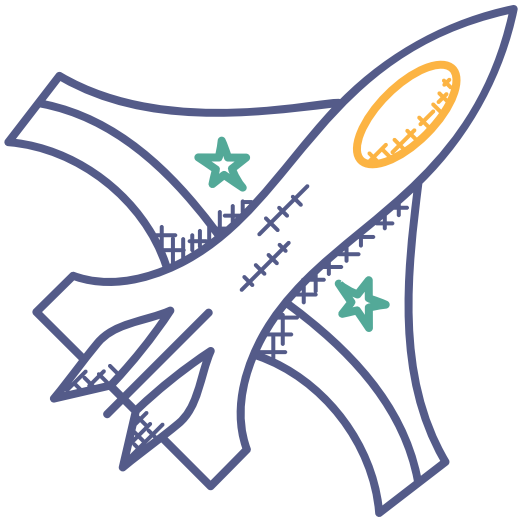
    a. Troposphere: 19 nitrogen, 5 oxygen, and 1 other
    b. Stratosphere: 11 nitrogen, 3 oxygen, and 1 other
    c. Mesosphere: 6 nitrogen, 1 oxygen
    d. Thermosphere: 2 nitrogen

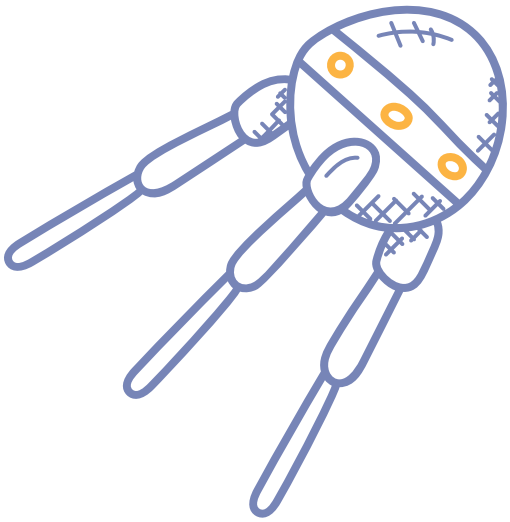
Troposphere

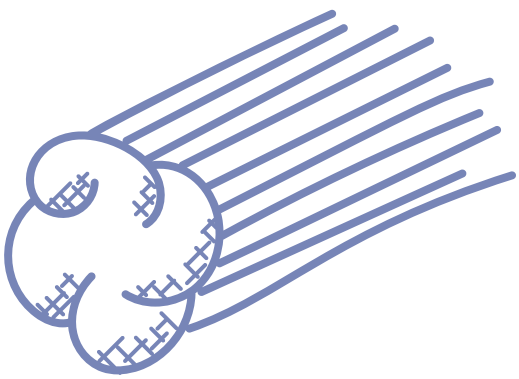
Stratosphere

Mesosphere

Thermosphere







LESSON 7: KONSTANTIN EDUARDOVICH TSIOLKOVSKY

Man will not always stay on Earth; the pursuit of light and space will lead him to penetrate the bounds of the atmosphere, timidly at first, but in the end to conquer the whole of outer space.

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LESSON 7: KONSTANTIN EDUARDOVICH TSIOLKOVSKY

Lesson 7 Quiz

1. **What is the atmosphere made up of?**

   A) Water
   B) Smoke
   C) Gases
   D) Clouds

2. **As you get further from the ground, the atmosphere gets thicker.**

   A) True
   B) False

3. **Weather takes place in the:**

   A) mesosphere
   B) thermosphere
   C) stratosphere
   D) troposphere

4. **Where do commercial airplanes fly?**

   A) Mesosphere
   B) Thermosphere
   C) Stratosphere
   D) Troposphere

5. **What is the special layer in the stratosphere that protects us from the harmful rays from the sun?**

   A) Ozone layer
   B) Sun layer
   C) Screening layer
   D) Oxygen layer

6. **What layer acts as a force field against space rocks by burning up meteors?**

A) Mesosphere
B) Thermosphere
C) Stratosphere
D) Troposphere

7. **Which layer acts like a big energy sponge and gets hotter the higher you go?**

A) Mesosphere
B) Thermosphere
C) Stratosphere
D) Troposphere

8. **What cool light shows appear when bits of the sun's energy gets trapped in the thermosphere?**

A) Sunbeams
B) Shooting stars
C) Night lights
D) Auroras

9. **Which of the following is NOT one of the jobs of the atmosphere?**

A) Keeps temperatures in the right range for life on Earth
B) Provides us with oxygen to breathe
C) Helps to form rocks in the geosphere
D) Protects us from meteors

8 WATER WORLD

The earth is called the blue planet. From space our planet appears blue due to all of the water covering its surface. From oceans and lakes, to rivers and streams, water is the most common substance on Earth, and it is what makes life possible.

Recommended Reading

- *The Hydrosphere: Agent of Change*, by Gregory Vogt, Introduction & Chapter 1
- *Follow the Water From Brook to Ocean*, by Arthur Dorros
- *Rocks, Rivers, and the Changing Earth: A First Book About Geology*, by Herman Schneider and Nina Schneider, Introduction & Chapter 1
- *Oceans: Making Waves!,* by Simon Basher, Chapter 1

ACTIVITY All the Waters of the World

Fresh water is an incredibly important resource on Planet Earth—all living things require water to survive. Yet fresh water is also a limited resource, and many poor communities around the world struggle with adequate freshwater supply. This lesson will allow you to see just how little fresh water there is on Earth.

SUPPLIES

- 1-gallon jar or jug
- 4 smaller jars or bowls
- Measuring cups and spoons
- Food coloring (optional)
- Water
- Salt
- Pipette or eyedropper

INSTRUCTIONS

1. Cut out the five labels included with this lesson and fold them along the dotted line.
2. Fill a one-gallon jar or jug with water. You may add food coloring to make the water more visible during this activity. This represents the total water available on Earth.
3. In a smaller bowl, measure out ½ cup plus one tablespoon of water from the gallon jug. The smaller bowl of water represents the amount of fresh water on Earth.
4. What is left in the one-gallon jug represents the salt water on Earth. Place the "Salt water" label in front of this jug.
5. Add seven tablespoons of salt to the salt water jug of water. Stir it well until the salt has dissolved. This is approximately how salty the ocean waters are. Dip your finger in the salt water and taste how salty it is.
6. Using an eyedropper or pipette, remove two drops from the freshwater bowl and place into a new bowl. These drops represent the amount of fresh water in rivers. Place the "Rivers" label in front of this bowl.

INSTRUCTIONS, CONTINUED

7. Using an eye dropper or pipette, remove 10 drops from the freshwater bowl and place into a new bowl. These drops represent the amount of fresh water in lakes. Place the "Lakes" label in front of this bowl.
8. Measure out 2 1/2 tablespoons of fresh water and place into a new bowl. This represents the amount of fresh groundwater. Place the "Groundwater" label in front of this bowl.
9. You should have about 5 1/2 tablespoons left in your freshwater bowl. This represents the amount of fresh water trapped in ice on the earth. Place the "Ice" label in front of this bowl.

SALT WATER

RIVERS

LAKES

GROUNDWATER

ICE

QUESTIONS

Rivers and lakes are a fairly easy source of fresh water; however, water from these locations isn't often available to people. Ask an adult where the water in your home comes from and have them help you research other ways people are able to get fresh, drinkable water.

LESSON 8: SYLVIA EARLE

There's plenty of water in the universe without life, but nowhere is there life without water.

There's plenty of water in the universe without life, but nowhere is there life without water.

Lesson 8 Quiz

1. **The part of the ocean where no sunlight reaches is called the _____ zone.**

   A) dark
   B) freezing
   C) black
   D) midnight

2. **We have explored all of the ocean floor.**

   A) True
   B) False

3. **What kind of water is found in the ocean?**

   A) Fresh water
   B) Dirty water
   C) Salt water
   D) Groundwater

4. **What kind of water is found in lakes, ponds, and rivers?**

   A) Fresh water
   B) Dirty water
   C) Salt water
   D) Groundwater

5. **What is the special kind of fresh water found deep in the earth called?**

   A) Fresh water
   B) Dirty water
   C) Salt water
   D) Groundwater

6. **The three phases of water are solid, liquid, and gas.**

   A) True
   B) False

7. **Clouds are made up of _____.**

   A) ice
   B) groundwater
   C) vapor
   D) dust

8. **When snow and ice stick together in areas where it is very cold, they form _____.**

   A) sinkholes
   B) lakes
   C) rivers
   D) glaciers

9 SURF'S UP

The oceans are constantly on the move! In this lesson, we explore the oceans movements. Waves crash towards the shore. Currents create paths in the sea. And tides cause the waters of the ocean to rise and fall.

Recommended Reading

- *The Hydrosphere: Agent of Change*, by Gregory Vogt, Chapter 4
- *Rocks, Rivers, and the Changing Earth: A First Book About Geology*, by Herman Schneider and Nina Schneider, Chapters 6 & 7
- *Oceans: Making Waves!,* by Simon Basher, Chapter 2
- *Exploring the Deep Dark Sea*, by Gail Gibbons
- *Stickmen's Guide to Oceans in Layers*, by Catherine Chambers

ACTIVITY Ocean Exploration

Take a trip around the world and explore the world's oceans! You have the opportunity to spend time researching each of the oceans to compile a fact file on each one.

SUPPLIES

- Colored pencils or crayons

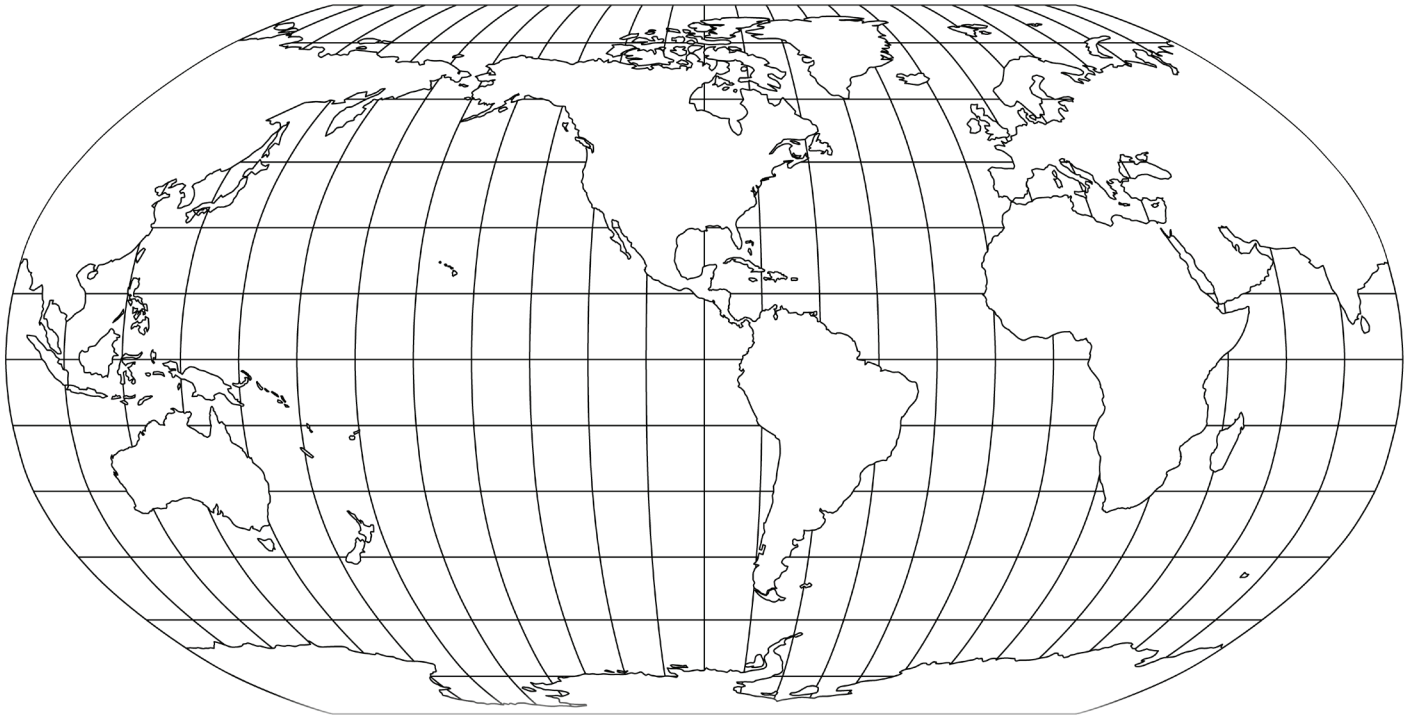
INSTRUCTIONS

1. Ask a parent to help you find some books or online resources to research each of the oceans.
2. Fill in the blanks on the following fact files with the information you find in your research.
3. In the Fun Facts section be sure to indicate any fun facts you learn about your ocean and which ocean is the:
   - Largest
   - Smallest
   - Deepest
   - Most shallow
   - Coldest
   - Warmest

OCEAN FACT FILE:

INDIAN OCEAN

Color the Indian Ocean on the map below.



Average temperature: _____

Average depth: _____

Size of the ocean: _____

Deepest point: _____

Fun facts: _____

_____

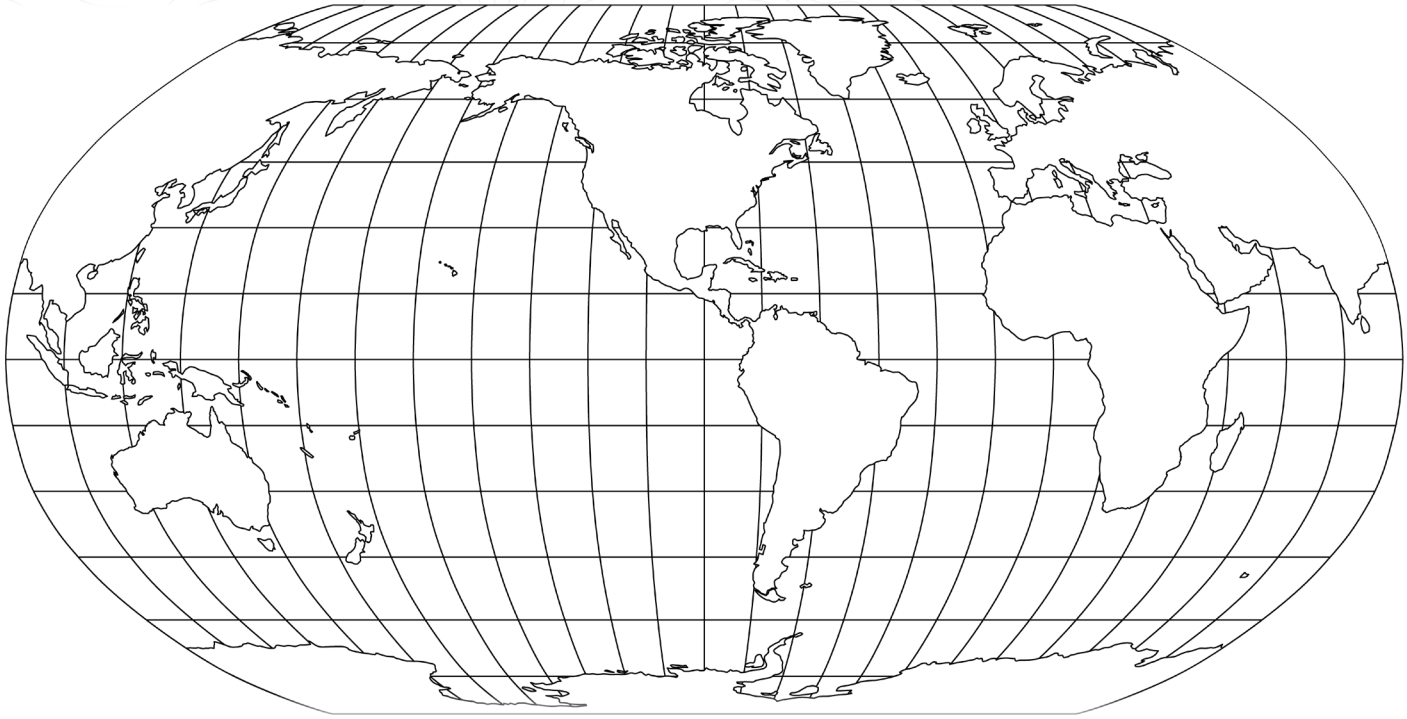
_____

_____

OCEAN FACT FILE:

ARCTIC OCEAN

Color the Arctic Ocean on the map below.



Average temperature: _____

Average depth: _____

Size of the ocean: _____

Deepest point: _____

Fun facts: _____

_____

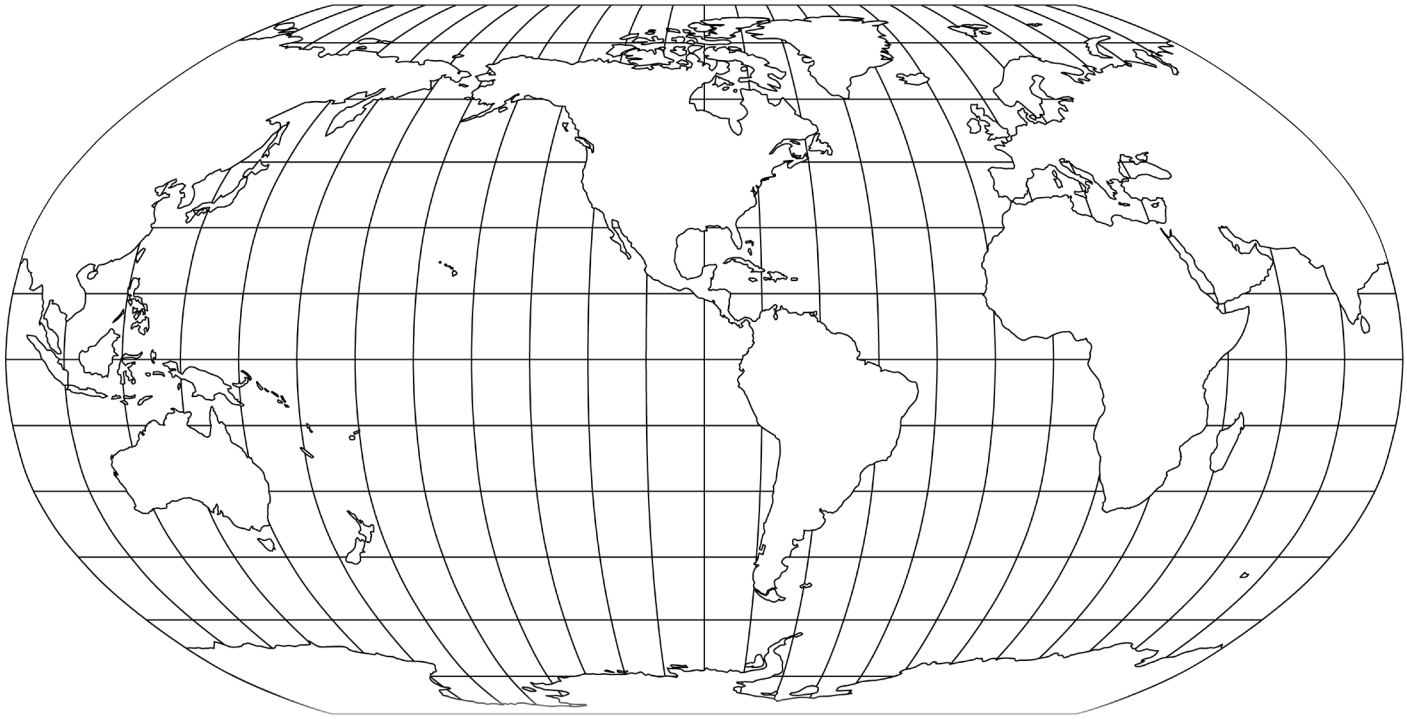
_____

_____

OCEAN FACT FILE:

ATLANTIC OCEAN

Color the Atlantic Ocean on the map below.



Average temperature: _____

Average depth: _____

Size of the ocean: _____

Deepest point: _____

Fun facts: _____

_____

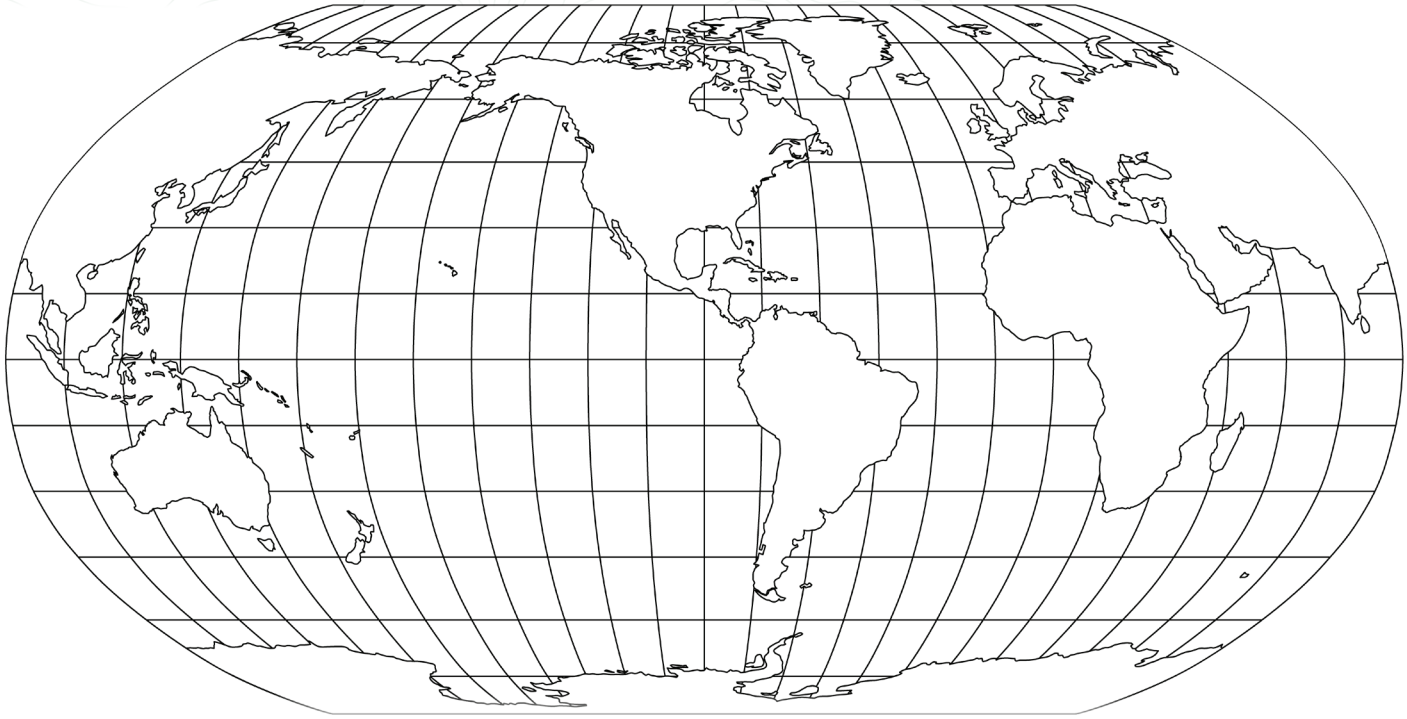
_____

_____

OCEAN FACT FILE:

PACIFIC OCEAN

Color the Pacific Ocean on the map below.



Average temperature: _____

Average depth: _____

Size of the ocean: _____

Deepest point: _____

Fun facts: _____

_____

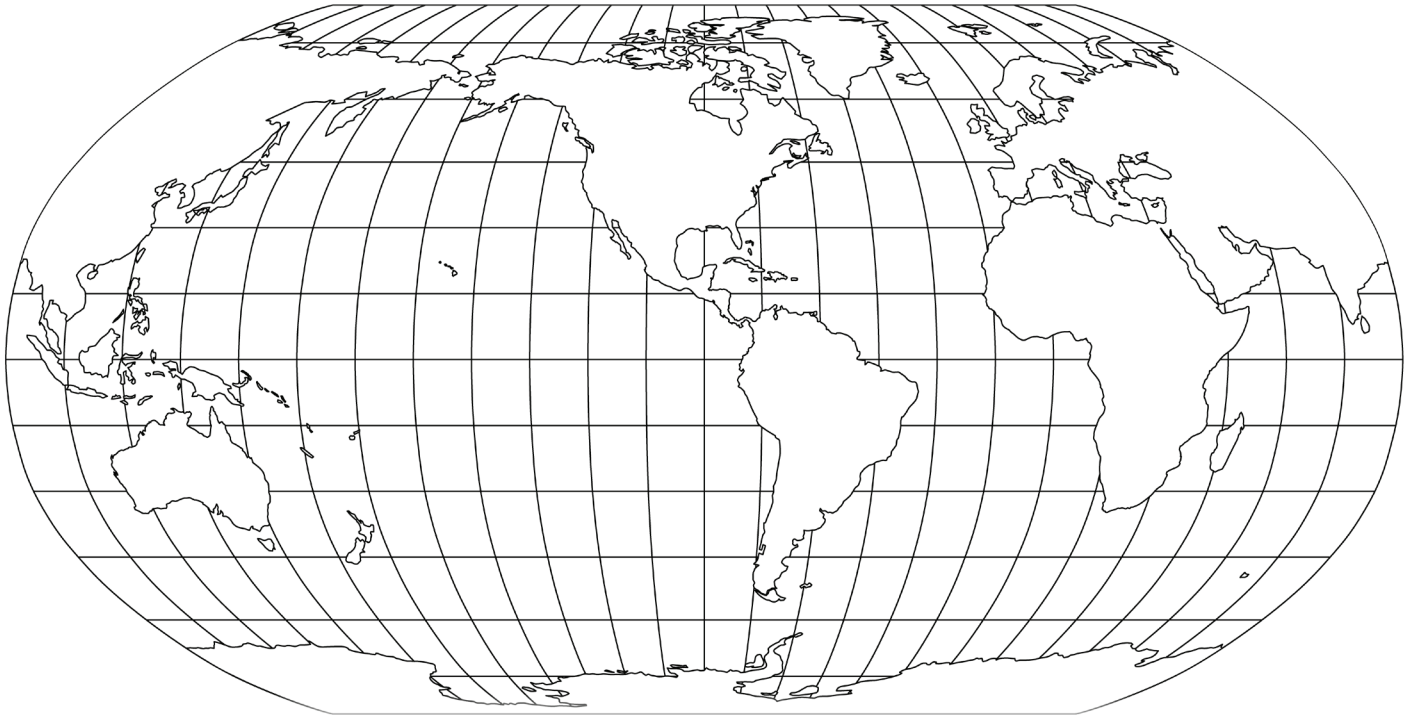
_____

_____

OCEAN FACT FILE:

SOUTHERN OCEAN

Color the Southern Ocean on the map below.



Average temperature: _____

Average depth: _____

Size of the ocean: _____

Deepest point: _____

Fun facts: _____

_____

_____

_____

LESSON 9: MATTHEW FONTAINE MAURY

There is a river in the ocean. In the severest droughts it never fails, and in the mightiest floods it never overflows.

LESSON 9: MATTHEW FONTAINE MAURY

There is a river in the ocean. In the severest droughts it never fails, and in the mightiest floods it never overflows.

LESSON 9: MATTHEW FONTAINE MAURY

Lesson 9 Quiz

1. **How many oceans are there?**

   A) 3
   B) 5
   C) 7
   D) 9

2. **Which ocean is the biggest?**

   A) Southern
   B) Atlantic
   C) Pacific
   D) Indian

3. **Waves are mostly created by:**

   A) rain
   B) wind
   C) tides
   D) gravity

4. **The reason we have high and low tides is due to:**

   A) rain
   B) wind
   C) currents
   D) gravity

5. **_____ are the normal pattern of movement the ocean follows.**

   A) Tides
   B) Waves
   C) Storms
   D) Currents

6. **Ocean currents flow _____ in the Northern Hemisphere.**

A) up and down
B) counterclockwise
C) diagonally
D) clockwise

7. **The temperature of an ocean is influenced by surface currents.**

A) True
B) False

8. **The periodic rise and fall of water levels in the ocean are called:**

A) waves
B) currents
C) tides
D) pools

HIGH-QUALITY H_2O

In this lesson, we'll be exploring the freshwater locations in the world, from lakes and rivers, to glaciers, icebergs, and groundwater found deep within the earth.

Recommended Reading

- *Glacier on the Move*, by Elizabeth Rusch
- *The Hydrosphere: Agent of Change*, by Gregory Vogt
- *Rocks, Rivers, and the Changing Earth: A First Book about Geology*, by Herman Schneider and Nina Schneider, Chapter 3
- *The Water Beneath Your Feet*, by Ellen Lawrence
- *Icebergs & Glaciers*, by Seymour Simon

ACTIVITY Constructing an Aquifer

This activity will allow you to visualize how the earth holds water both above and below its surface. You'll be building a model of an underground aquifer, and you'll have the opportunity to see how aquifers impact surrounding freshwater sources.

SUPPLIES

- Plastic shoebox
- Small stones
- Sand
- Soil
- Grass or weed clippings
- Water
- Food coloring (optional)
- Plastic cup
- Pin

INSTRUCTIONS

1. Add sand to one side of a plastic shoebox until it is approximately one inch deep. Do not worry if a little sand falls to the opposite side.
2. On top of the sand, add small stones until they are approximately one inch deep.
3. On top of the stones, add soil until it is approximately one inch deep and pat down the soil.
4. Add a layer of grass on top of your soil to represent vegetation.
5. You have now created a model of an aquifer on one side of your shoebox. There is likely a small amount of sand, stones, and soil that have fallen on the other side, but it should not be near as deep.
6. Take your plastic cup and poke the bottom of the cup with a pin many times. You will be filling this cup with water to simulate rain over your aquifer.
7. (optional) Color the water you'll be using with food coloring to help you more easily visualize the water you'll be adding to your model.

INSTRUCTIONS, CONTINUED

8. Holding your plastic cup over your shoebox model, fill the cup with water and make it rain on the model until a small lake forms on the side of the shoebox opposite the aquifer.

9. Now, add some more water to your model and watch what happens to the water as it is added. Some of the water falls onto the soil and runs into the lake. Some of the water begins to seep into the soil and fill the aquifer.

10. Observe your lake. The lake is getting water directly from the rain and also from water moving through the aquifer.

11. Stop the rain when the water in your lake is about one inch deep.

LESSON 10: PSALM 104:10-11A

You make springs gush forth in the valleys;
they flow between the hills; they give drink to
every beast of the field.

LESSON 10: PSALM 104:10-11A

You make springs gush forth in the valleys; they flow between the hills; they give drink to every beast of the field.

LESSON 10: PSALM 104:10-11A

Lesson 10 Quiz

1. **What is the difference between salt water and fresh water?**

   A) Fresh water is much saltier
   B) Salt water has different animals in it
   C) Fresh water only comes from rain
   D) Salt water is much saltier

2. **Animals that live in salt water can also live in fresh water.**

   A) True
   B) False

3. **Waters that are not flowing but stay in one place are called:**

   A) lentic
   B) stationary
   C) lotic
   D) static

4. **There is 30 times more fresh water underground than in lakes and rivers.**

   A) True
   B) False

5. **Flowing water that is not stationary is called:**

   A) lentic
   B) stationary
   C) lotic
   D) static

6. **How can we get groundwater that is close to the surface?**

A) Building a pool
B) Digging a well
C) Removing the topsoil
D) Creating a spring

7. **What appears where an aquifer overflows?**

A) An ocean
B) A waterfall
C) A cloud
D) A spring

8. **Where is 75% of the earth's fresh water found?**

A) Oceans
B) Rivers
C) Glaciers
D) Lakes

9. **Glaciers can be found on every continent except:**

A) Australia
B) Europe
C) Asia
D) Africa

10. **What are large chunks of ice that break off of a glacier called?**

A) Rain
B) Icebergs
C) Ponds
D) Icicles

WATER WORKS

Water has important characteristics which allow it to go through the water cycle. The water cycle is a never-ending sequence of evaporation, condensation, and precipitation that's vital for life on Earth.

Recommended Reading

- *Water: Up, Down, and All Around*, by Natalie M. Rosinsky
- *Water Is Water*, by Miranda Paul
- *The Hydrosphere: Agent of Change*, by Gregory Vogt, Chapter 2
- *Water, Water Everywhere*, by Melvin and Gilda Berger
- *Scientists Who Changed History*, by DK, p. 111: John Dalton

ACTIVITY Water Cycle in a Bowl

The water cycle is an important process allowing the earth to use and reuse water. In this activity, you'll be able to use a few items from around the house to watch the water cycle happen right in front of your eyes!

SUPPLIES

- Large glass bowl
- Small glass bowl or glass
- Hot water
- Salt
- 1 teaspoon measuring spoon
- Plastic wrap
- Ice cubes

INSTRUCTIONS

1. Add 2-3 teaspoons of salt to a large glass bowl.
2. Get some help from an adult to boil some water on the stove or in the microwave. Then allow the adult to pour some water into the bowl.
    a. The amount of water you need will vary depending on the size of your bowl.
    b. To determine how much you need, be sure your small bowl or glass can sit in the middle of your large bowl without water getting into the small container.
3. Gently stir the water in your large glass bowl until the salt is dissolved. This salty water represents ocean water.
4. Now place your small bowl or glass in the center of the large bowl being sure it stays empty.
5. Cover the large bowl with plastic wrap. Adjust the tightness of the wrap so it is firmly sealed, but dips slightly in the middle without touching the top of the small bowl or glass.
6. Place several ice cubes on top of the plastic wrap. This simulates the decrease in temperature that occurs high in the atmosphere.

INSTRUCTIONS, CONTINUED

7. Allow the water to sit undisturbed. Observe what happens in the bowl. You should see several things happen:

    a. The hot water evaporates and the steam rises.
    b. As the steam reaches the plastic wrap, it condenses.
    c. The condensation drops into the smaller bowl as precipitation.

8. Draw a picture on the following page of what your experiment looks like. Show the different places you see water and label the places you see evaporation, condensation, and precipitation.

9. After a couple of hours, carefully take the plastic wrap off of the large bowl.

10. Dip your finger in the water in the large bowl and taste it. Dip your finger in the water in the small bowl and taste it.

    a. The water in the large bowl should taste salty and the water in the small bowl should not taste salty.
    b. When evaporation occurs, it is only the water that evaporates and goes through the water cycle, not the salt, minerals, or other impurities that are in the water.

WATER CYCLE IN A BOWL

LESSON 11: ECCLESIASTES 1:7

All streams run to the sea, but the sea is not full; to the place where the streams flow, there they flow again.

LESSON 11: ECCLESIASTES 1:7

All streams run to the sea, but the sea is not full; to the place where the streams flow, there they flow again.

LESSON 11: ECCLESIASTES 1:7

Lesson 11 Quiz

1. **What is a long period of time without rain called?**

   A) Monsoon
   B) Drought
   C) Dustbowl
   D) Summer

2. **What do people, especially scientists, sometimes call water?**

   A) H_2O
   B) Wa wa
   C) O_2H
   D) OH

3. **Freezing is when a liquid changes from a _____ to a _____.**

   A) gas; liquid
   B) solid; gas
   C) liquid; solid
   D) solid; liquid

4. **When a solid changes into a liquid it is:**

   A) melting
   B) evaporating
   C) freezing
   D) vaporizing

5. **When a liquid changes to a gas it is called evaporation.**

   A) True
   B) False

6. **What is a gas changing into a liquid called?**

A) Melting
B) Vaporizing
C) Evaporation
D) Condensation

7. **When water falls from the clouds, we call this:**

A) vaporizing
B) precipitation
C) condensation
D) evaporation

8. **What are the three stages of the water cycle called?**

A) Freezing, melting, vaporizing
B) Condensing, melting, and freezing
C) Evaporation, condensation, and precipitation
D) Warming, cooling, and melting

ON CLOUD NINE

Look up in the sky and you may see swirls of white in the sky making pictures of animals and castles and all sorts of mythical things. In this lesson, you'll be exploring how these white puffs carry water throughout our atmosphere.

Recommended Reading

- *Clouds: Faces of the Sky*, by Jenny Markert
- *Weather*, by Rebecca Rupp, Chapter 4
- *The Weather Book* or *The New Weather Book*, by Michael Oard, Chapters 1 & 3
- *The Man Who Named the Clouds*, by Julie Hannah and Joan Holub

ACTIVITY Cloud Identification

In this activity, you'll be creating a cloud viewer! This cloud viewer will help you identify the clouds you can see wherever you are.

SUPPLIES

- Scissors
- Glue, glue stick, or tape
- Cardstock

INSTRUCTIONS

1. Cut out the cloud pictures on the following page.
2. Place the cloud viewer horizontally (long ways across) in front of you.
3. Arrange the cloud pictures on your cloud viewer in the following way:
    a. Across the very top of your cloud viewer place the pictures of the clouds that are found high in the sky:
        - Cirrus: light wispy strands with blue sky visible
        - Cirrocumulus: appear in rows with small, white cloudlets
        - Cirrostratus: very thin cloud blanket
    b. Along the sides, two on the right and one on the left, place pictures of the clouds that are found at a medium level:
        - Altostratus: dull, flat, cloud blankets
        - Altocumulus: round, white, or gray patches
        - Nimbostratus: thick, dark layer

INSTRUCTIONS, CONTINUED

c. Along the bottom, place the pictures of the clouds that are found low in the sky:
    - Cumulus: detached cotton-ball-like clouds
    - Stratocumulus: rows of cloudlets, but larger than cirrocumulus and can appear darker
    - Cumulonimbus: towering gray clouds
    - Stratus: low, gray, featureless fog

d. When your pictures are arranged correctly, there should be a wide, blank area in the center of your cloud viewer.

4. Glue or tape your pictures to your cloud viewer.

5. Glue or tape your cloud viewer page to a piece of cardstock.

6. Using scissors, cut out the rectangular blank area that's in the center of your cloud viewer.

7. You now have a complete cloud viewer. You can use the pictures on your cloud viewer to help you identify clouds.

8. Go outside each day over the coming week to look for clouds. Use your cloud viewer to help you identify the types of clouds you're seeing. Be sure to keep your cloud viewer. You'll need to use it in the next several lessons!

EARTH SCIENCE EXPLORED elementary

CLOUD VIEWER

CLOUD PICTURES

LESSON 12: LUKE 12:54

He also said to the crowds, "When you see a cloud rising in the west, you say at once, 'A shower is coming.' And so it happens.

LESSON 12: LUKE 12:54

He also said to the crowds, "When you see a cloud rising in the west, you say at once, 'A shower is coming.' And so it happens.

LESSON 12: LUKE 12:54

Lesson 12 Quiz

1. **Clouds are classified by their height and color.**

   A) True
   B) False

2. **We find clouds in the:**

   A) troposphere
   B) mesosphere
   C) stratosphere
   D) thermosphere

3. **Clouds are formed from clumps of:**

   A) ice
   B) sand
   C) water vapor
   D) salt water

4. **Which clouds are found at a medium height?**

   A) Cumulo
   B) Nimbo
   C) Alto
   D) Cirro

5. **Which clouds produce rain?**

   A) Cumulo
   B) Nimbo
   C) Alto
   D) Cirro

6. **When clouds get so full it begins to rain, we call this:**

   A) evaporation
   B) condensation
   C) precipitation
   D) solidification

7. **A piece of dust that water vapor clings to and begins the formation of a cloud is called a cloud condensation nucleus.**

   A) True
   B) False

13 HOW'S THE WEATHER?

Predicting the weather involves observing many things: temperature, air pressure, clouds, and more. In this lesson, you'll learn about some of the factors meteorologists look at when predicting the weather.

Recommended Reading

- *Weather*, by Rebecca Rupp, Chapters 2, 3, & 8
- *Fahrenheit, Celsius, and Their Temperature Scales*, by Yoming S. Lin
- *Feel the Wind*, by Arthur Dorros
- *Weather Words and What They Mean*, by Gail Gibbons
- *The Weather Book* or *The New Weather Book*, by Michael Oard, Chapter 2
- *Weather*, by Seymour Simon
- *Weather Forecasting*, by Gail Gibbons

ACTIVITY Create a Weather Journal

This week you'll begin a weather journal! Take the time to pay attention to the weather where you are each day and observe how conditions change every day.

SUPPLIES

- Pen or pencil
- Copies of Weather Journal page

INSTRUCTIONS

1. Once or twice a day go outside to observe the weather and take notes. It's recommended you go outside once in the morning and once in the afternoon.
2. Fill in the blanks in your weather journal.
3. When considering the cloud conditions remember the following:
   - Sunny - ⅛ or less cloud coverage
   - Mostly Sunny - ¼ cloud coverage
   - Partly cloudy/partly sunny - ½ cloud coverage
   - Mostly cloudy - ¾ cloud coverage
   - Cloudy - ⅞ or more cloud coverage
4. If there are clouds in the sky, use your cloud identifier you created in lesson 12 to help you identify the types of clouds.
5. Hole punch your journal pages and put them in a folder or binder to keep track of how the weather in your area changes each day.

Weather Journal

Date: _____ Time: _____ am / pm Temperature: _____

CLOUD CONDITIONS

Sunny Mostly Sunny Partly cloudy/partly sunny

Mostly cloudy Cloudy

PRECIPITATION

Rain Snow Hail Sleet Freezing Rain None

IDENTIFY THE TYPES OF CLOUDS IN THE SKY

_____

_____

_____

_____

LESSON 13: GENESIS 8:22

While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night shall not cease.

LESSON 13: GENESIS 8:22

While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night shall not cease.

LESSON 13: GENESIS 8:22

Lesson 13 Quiz

1. **The weather in a particular area does not change for long periods of time.**

   A) True
   B) False

2. **What is a scientist that studies the weather called?**

   A) Meteorologist
   B) Weatherman
   C) Cloudologist
   D) Weatherologist

3 **When air moves from a high pressure area to a low pressure area, it causes:**

   A) rain
   B) wind
   C) snow
   D) clouds

4. **When there is low pressure, the weather is typically:**

   A) cloudy, cooler, and damp
   B) sunny and cooler
   C) cloudy and hot
   D) sunny, hot, and dry

5. **When there is high pressure, the weather is typically:**

   A) large thunderstorms
   B) very cloudy with cooler temperatures
   C) warm, dry, and sunny
   D) partly cloudy with a lot of wind

6. **If three-fourths of the sky is covered with clouds, meteorologists call it:**

A) sunny
B) mostly sunny
C) cloudy
D) mostly cloudy

7. **Meteorologists use temperature and pressure to predict the weather.**

A) True
B) False

8. **Temperature helps us determine what kind of _____ we might have.**

A) clouds
B) hail
C) snow
D) precipitation

RAINING CATS & DOGS

There are five different types of precipitation: rain, snow, freezing rain, sleet, and hail. In this lesson, you'll learn about the clouds and weather fronts that bring precipitation of all shapes and kinds!

Recommended Reading

- *Weather*, by Rebecca Rupp, Chapters 5-7
- *Down Comes the Rain*, by Franklyn Branley
- *The Weather Book* or *The New Weather Book*, by Michael Oard, Chapters 4 & 7
- *The Secret Life of a Snowflake*, by Kenneth Libbrecht
- *Storms*, by Seymour Simon
- *Lightning*, by Seymour Simon

ACTIVITY Create a Rain Gauge & Continue Weather Observations

You'll create a rain gauge this week so you can measure how much precipitation you receive in your area as you continue to observe the weather.

SUPPLIES

- Pen or pencil
- Copies of new Weather Journal Pages
- Plastic 2-liter bottle
- Scissors or utility knife
- Pebbles, sand, or marbles
- Tape measure or ruler
- Permanent marker
- Paper clips

INSTRUCTIONS

1. Remove the cap and label from your 2-liter bottle and discard them.
2. With a parent's help, very carefully cut the top off of your bottle. Cut where the bottle begins to slope inward towards the top.
3. Place some pebbles, sand, and/or marbles in the bottom of your bottle filling the uneven part of your bottle. This material will help keep your bottle weighed down when it's outside.
4. Pour a little bit of water in the bottle, just until it's covered the top of the stones. The top of this point will be your 0 cm mark. You'll begin measuring precipitation from this point.
5. Hold a ruler or tape measure up to the side of your bottle, making sure the 0 point on your ruler lines up with the top of the water.
6. Use a permanent marker to mark each centimeter, starting with 1, up the side of your bottle. Label each of your marks.
7. Flip the top part of the bottle upside down and place it back on top of the bottom portion of the bottle. This will serve as a funnel to direct the rain inside your bottle.

INSTRUCTIONS, CONTINUED

8. Secure the top of your bottle to the bottom with paper clips.
9. Place your new rain gauge on level ground outside. You may want to dig a shallow hole to place your rain gauge in or place rocks around it to prevent it from tipping over.
10. Continue to track the weather once or twice a day throughout the week using the Weather Journal pages.
11. After you receive precipitation, check your rain gauge and record the amount of precipitation you received on a Weather Journal page.

Weather Journal

Date: _____ Time: _____ am / pm Temperature: _____

CLOUD CONDITIONS

Sunny Mostly Sunny Partly cloudy/partly sunny

Mostly cloudy Cloudy

PRECIPITATION

Rain Snow Hail Sleet Freezing Rain None

AMOUNT OF PRECIPITATION: _____

IDENTIFY THE TYPES OF CLOUDS IN THE SKY

_____

_____

_____

LESSON 14: PSALM 135:7

He it is who makes the clouds rise at the end of the earth, who makes lightnings for the rain and brings forth the wind from his storehouses.

LESSON 14: PSALM 135:7

He it is who makes the clouds rise
at the end of the earth, who makes
lightnings for the rain and brings
forth the wind from his storehouses.

LESSON 14: PSALM 135:7

Lesson 14 Quiz

1. **What is the area where a warm air mass and a cold air mass meet called?**

   A) Front
   B) Thunderstorm
   C) Storm center
   D) Nimbo

2. **Rain showers from a cumulonimbus cloud last for a long time.**

   A) True
   B) False

3. **What type of clouds are formed at a warm front and can produce rain for a long time?**

   A) Nimbostratus
   B) Cumulonimbus
   C) Cirrocumulus
   D) Altostratus

4. **When water vapor goes directly from gas to solid ice, what type of precipitation do we get?**

   A) Rain
   B) Sleet
   C) Freezing rain
   D) Snow

5. **When rain hits the freezing ground and turns to ice, we call this:**

   A) rain
   B) sleet
   C) freezing rain
   D) snow

6. _____ begins as rain, but becomes ice in the air as it's falling to the ground.

A) Hail
B) Sleet
C) Freezing rain
D) Snow

7. What are balls of ice that form in cumulonimbus clouds called?

A) Hail
B) Sleet
C) Freezing rain
D) Snow

8. When a cloud give electrons to a different part of the cloud, we see:

A) thunder
B) rain
C) snow
D) lightning

15 WE'RE NOT IN KANSAS ANYMORE

When large, rotating columns of air called funnel clouds strike the ground, it becomes known as a tornado. Tornadoes can be very destructive, causing damage to property and loss of life. In this lesson, you'll learn about the clouds and air patterns that cause tornadoes to occur and how scientists classify tornadoes.

Recommended Reading

- *Tornadoes!*, by Gail Gibbons
- *Tornadoes!*, by Lorraine Jean Hopping
- *The Weather Book* or *The New Weather Book*, by Michael Oard, Chapter 5
- *Tornadoes*, by Seymour Simon

ACTIVITY Terrible Twisters

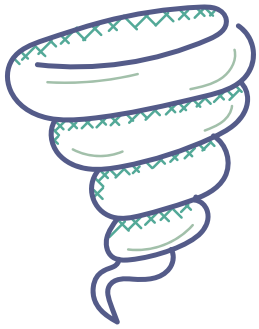
Scientists use the Fujita Scale to rate tornadoes based on their wind speeds and how damaging they are. The scale ranges from an F0 tornado which indicates very light damage, all the way up to F5 which indicates incredible damage. In this activity, you'll spend time researching actual tornadoes that have occurred and comparing the damage they've caused.

SUPPLIES

- Pen or pencil
- Copies of the Terrible Twisters worksheet

INSTRUCTIONS

1. Spend time reading about actual tornadoes that have occurred. You can use online resources or books.
2. Choose 3-4 tornadoes with different ratings and fill in the Terrible Twisters worksheet for each one.



TERRIBLE TWISTERS

Date _____

Rating _____

Location _____

Damaging Effects

LESSON 15: CORRIE TEN BOOM

In the center of a hurricane, there is absolute peace and quiet. There is no safer place than in the center of the will of God.

LESSON 15: CORRIE TEN BOOM

In the center of a hurricane, there is absolute peace and quiet. There is no safer place than in the center of the will of God.

LESSON 15: CORRIE TEN BOOM

Lesson 15 Quiz

1. **What is a fast rotating column of wind that touches the earth's surface called?**

   A) Hurricane
   B) Tornado
   C) Funnel cloud
   D) Cyclone

2. **Meteorologists rate the intensity of storms using the _____ Scale.**

   A) Fiji
   B) Damage
   C) Tornado
   D) Fujita

3. **A tornado given an F5 rating causes light damage.**

   A) True
   B) False

4. **A funnel cloud becomes a tornado when _____.**

   A) it touches the ground
   B) wind speeds reach 100 miles per hour
   C) it starts to rain
   D) it causes damage

5. **What is formed when a cold front and a warm front come together and warm air rises quickly?**

   A) Upwind
   B) Wind tunnel
   C) Updraft
   D) Cyclone

6. **All tornadoes start as supercells, but not all supercells become tornadoes.**

   A) True
   B) False

7. **In the United States there is an area that gets so many supercells, it got the nickname _____.**

   A) Storm Central
   B) Tornado Alley
   C) the Storm States
   D) Tornado Zone

8. **How long do tornadoes typically last?**

   A) A few seconds
   B) About 10 minutes
   C) 2 hours
   D) A couple of days

16 THE EYE OF THE STORM

Hurricanes are huge storms with rotating winds that form over warm tropical waters. In this week's lesson, we'll be exploring these powerful storms that have the potential to cause great destruction when they approach land.

Recommended Reading

- *Hurricanes!*, by Gail Gibbons
- *Eye of the Storm*, by Rick Thomas
- *Hurricanes*, by Seymour Simon
- *The Weather Book* or *The New Weather Book*, by Michael Oard, Chapter 6

ACTIVITY Modeling a Hurricane

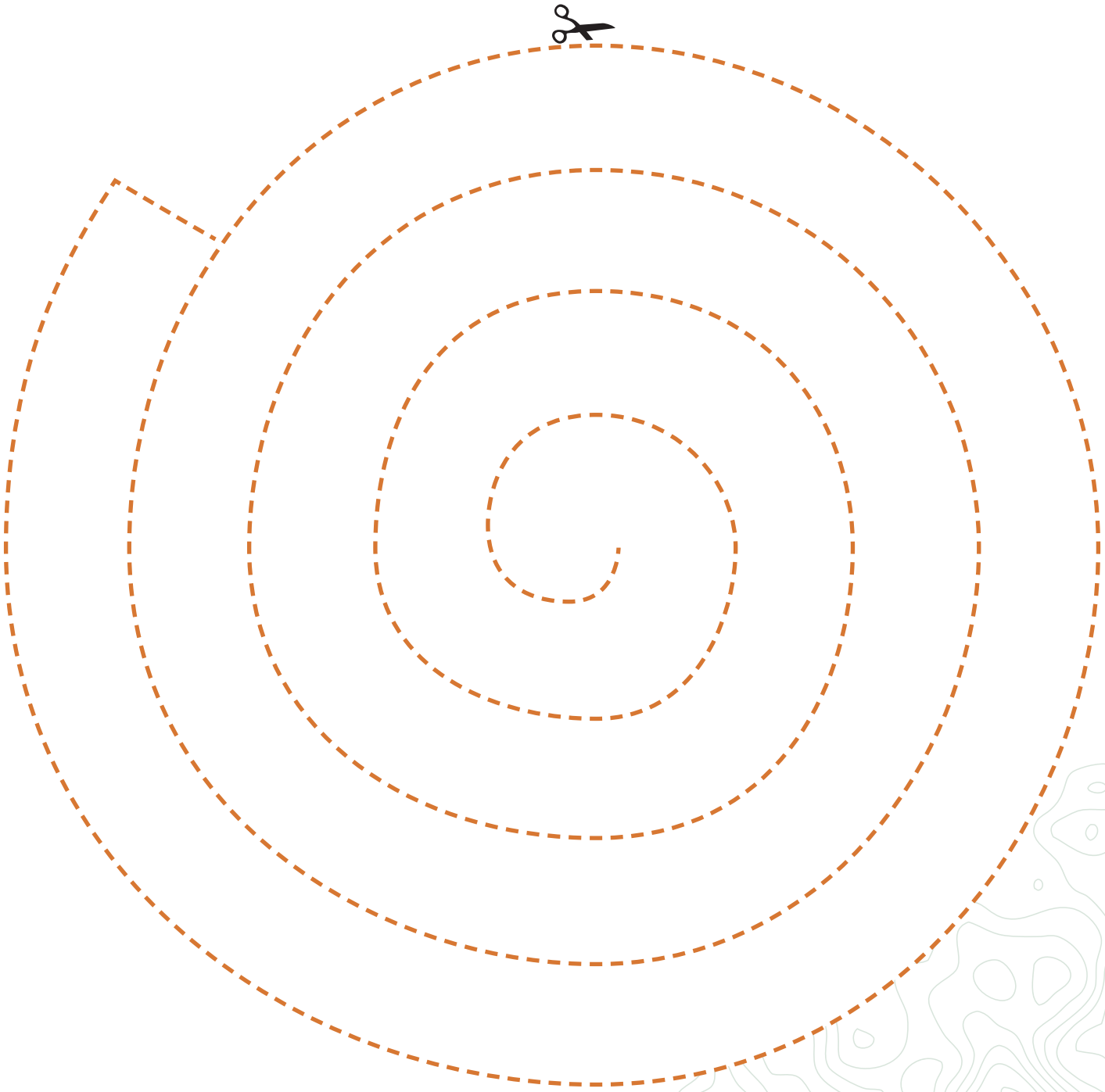
In this activity, you'll have a chance to create a paper model of a hurricane and see how rising heat causes a hurricane to spin.

SUPPLIES

- Scissors
- Lamp with a bright light bulb
- 12-18 inch piece of string

INSTRUCTIONS

1. Cut out the spiral on the following page.
2. Attach a piece of string to the small center part of the spiral.
3. Remove the shade from off of a lamp and turn the lamp on.
4. Hold the spiral above the light bulb, allowing the spiral to unfold.
5. The heat that is emitted from the lightbulb is similar to the warm air that rises off the ocean. As you hold the spiral above the lamp, you should see how the heat causes your model hurricane to spin.



LESSON 16: NAHUM 1:3

The Lord is slow to anger and great in power,
and the Lord will by no means clear the
guilty. His way is in whirlwind and storm,
and the clouds are the dust of his feet.

LESSON 16: NAHUM 1:3

The Lord is slow to anger and great in power, and the Lord will by no means clear the guilty. His way is in whirlwind and storm, and the clouds are the dust of his feet.

LESSON 16: NAHUM 1:3

Lesson 16 Quiz

1. **At what wind speed does a tropical storm become a hurricane?**

   A) 50 miles per hour
   B) 74 miles per hour
   C) 100 miles per hour
   D) 150 miles per hour

2. **Meteorologists rate the intensity of hurricanes based on the _____ Scale.**

   A) Saffir-Simpson
   B) hurricane damage
   C) Fujita
   D) wind speed

3. **The special pilots that fly into a hurricane to determine wind speeds call themselves what?**

   A) Storm chasers
   B) Cyclone spotters
   C) Wind warriors
   D) Hurricane hunters

4. **Which step of the water cycle is most important for the formation of a hurricane?**

   A) Condensation
   B) Evaporation
   C) Precipitation
   D) Transpiration

5. **The eye of a hurricane is very calm, with winds under twenty miles per hour.**

   A) True
   B) False

6. **Which climate zones do hurricanes form in?**

A) Temperature and Tropic
B) Polar and Subpolar
C) Subtropic and Subpolar
D) Tropic and Subtropic

7. **Hurricanes form in high-pressure areas.**

A) True
B) False

8. **What does a hurricane need to keep moving, that it loses when it reaches land?**

A) Warm water
B) Wind
C) Sun
D) Low pressure

9. **Hurricanes that form in the Indian Ocean are known as _____.**

A) tropical storms
B) twisters
C) cyclones
D) typhoons

17 PEELING BACK THE LAYERS

In this lesson, we'll be studying the layers of the earth under our feet. We'll be exploring the outside crust, traveling deeper to the hot mantle, and going all the way to the blazing hot metal inner core of the earth to learn more about the world God made.

Recommended Reading

- *The Geology Book*, by John Morris, Chapter 1
- *How to Dig a Hole to the Other Side of the World*, by Faith McNulty
- *The Street Beneath My Feet*, by Charlotte Guillain and Yuval Zommer
- *Earth's Crust,* by Conrad Storad, Chapter 1
- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 6-9
- *Rocks, Rivers, and the Changing Earth: A First Book about Geology*, by Herman Schneider and Nina Schneider, Chapters 9 & 10
- *Scientists Who Changed History*, by DK, p. 217: Inge Lehmann

ACTIVITY Layers of the Earth Diagram

In this activity, you have the opportunity to get creative! Think of a fun and unique way to display the layers of the earth and create a model.

SUPPLIES

- Various household items can be used

INSTRUCTIONS

1. Create a diagram of the earth's layers. You can be creative and use whatever supplies you have on hand. Consider using a drawing, paper model, play dough, food, computer design, or something else entirely!
2. Be sure your model clearly represents the following layers of the earth:
   - Crust
   - Upper Mantle
   - Lower Mantle
   - Outer Core
   - Inner Core
3. Be sure to email us with a picture of your creation! We can't wait to see what you've designed.

LESSON 17: ISAIAH 48:13

My hand laid the foundation of the earth, and my right hand spread out the heavens: when I call to them, they stand forth together.

LESSON 17: ISAIAH 48:13

My hand laid the foundation of the earth, and my right hand spread out the heavens; when I call to them, they stand forth together.

LESSON 17: ISAIAH 48:13

Lesson 17 Quiz

1. **From outside to inside the three layers of the earth are the _____, _____, and _____.**

   A) cap, middle, center
   B) core, mantle, crust
   C) crust, mantle, core
   D) mantle, crust, core

2. **The shell of the earth is called the:**

   A) mantle
   B) outer core
   C) inner core
   D) crust

3. **Scientists have dug all the way through the crust many times.**

   A) True
   B) False

4. **Which layer of the earth contains most of the earth's volume?**

   A) Mantle
   B) Outer core
   C) Inner core
   D) Crust

5. **The lower mantle is very _____.**

   A) solid
   B) hot
   C) cold
   D) bright

6. **We can divide the core into _____ parts.**

   A) 1
   B) 5
   C) 3
   D) 2

7. **The crust of the earth is made up of:**

   A) metal
   B) rock
   C) rock and metal
   D) water

8. **The core of the earth is made up of:**

   A) metal
   B) rock
   C) rock and metal
   D) water

9. **The mantle of the earth is made up of:**

   A) metal
   B) rock
   C) rock and metal
   D) water

10. **What is the name of the force field that the core provides to protect against harmful bits of energy in space?**

    A) Thermosphere
    B) Energysphere
    C) Spacefield
    D) Magnetosphere

18 IT'S ELEMENTARY

If you take a look around you, you'll notice rocks come in many different shapes, colors, and sizes. It's the minerals that make up the rocks that give each rock its unique characteristics. That's what you'll be studying in this lesson of Earth Science Explored Elementary.

Recommended Reading

- *A Rock is Lively*, by Dianna Hutts Aston and Sylvia Long
- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 24-41; 58-63
- *Minerals, Rocks, and Soil*, by Barbara Davis, pp. 4-21
- *Rocks, Minerals, and Soil*, by Susan Markowitz, Chapters 1 & 3
- *Rocks, Rivers, and the Changing Earth: A First Book about Geology*, by Herman Schneider and Nina Schneider, Chapter 4
- *Women in Science: 50 Fearless Pioneers who Changed Science*, by Rachel Ignotofsky, p. 27: Florence Bascom

ACTIVITY Rock Hunt!

This week you'll search for different types of rocks to build a rock collection, and then you will observe and describe the characteristics of the rocks you collected.

SUPPLIES

- Bucket
- 1 or 2 egg cartons
- Penny
- Steel nail
- Rock & mineral handbook (optional)

INSTRUCTIONS

1. Take a bucket or some other item for carrying rocks and go on a nature walk. Look all around you for different types of rocks.
2. When you find a unique rock, add it to your bucket. Look for rocks that appear different from one another and rocks that will fit into each of the depressions in your egg carton.
3. Try to find at least 12 different rocks so you can fill one egg carton. You can go out multiple times to look for rocks.
4. After you've created your rock collection, make copies of the Rock Characteristics page and fill out a page for each of your rocks.
    - Write down what color or colors your rock is.
    - Try to scratch your rock on the sidewalk and write down the color of the streak it leaves.
    - Circle whether your rock is rough or smooth to the touch.
    - Circle whether your rock appears shiny or dull.
    - Try to scratch your rock with a steel nail, penny, and your fingernail to help you determine how hard your rock is.
    - Write down any other unique features you notice about your rock.
5. If you have a rock and mineral handbook, see if you can use it to help you determine what type of rock you have found!

ROCK CHARACTERISTICS

Color: _____

Streak color: _____

Texture: **Rough** **Smooth**

Finish : **Shiny** **Dull**

HARDNESS

Really hard: cannot be scratched with a steel nail

Hard: can be scratched with a steel nail

Somewhat hard: can be scratched with a penny

Soft: can be scratched with your fingernail

OTHER UNIQUE CHARACTERISTICS

_____

_____

_____

_____

_____

_____

LESSON 18: PSALM 62:1-2

For God alone my soul waits in silence; from him comes my salvation. He alone is my rock and my salvation my fortress; I shall not be greatly shaken.

LESSON 18: PSALM 62:1-2

For God alone my soul waits in silence; from him comes my salvation. He alone is my rock and my salvation my fortress; I shall not be greatly shaken.

LESSON 18: PSALM 62:1-2

IT'S ELEMENTARY

Lesson 18 Quiz

1. **Rocks are made up of many different bits of _____.**

   A) soil
   B) chemicals
   C) minerals
   D) elements

2. **Minerals must be liquid, organic, and have a crystal structure.**

   A) True
   B) False

3. **Which of these is NOT a mineral?**

   A) Steel
   B) Salt
   C) Copper
   D) Calcium

4. **There are minerals inside of your body.**

   A) True
   B) False

5. **What do we call a scientist that studies rocks and gives them names?**

   A) Rockologist
   B) Mineralogist
   C) Geologist
   D) Elementologist

6. **Which is NOT a characteristic that scientists use to determine what kind of rock they are looking at?**

   A) Color
   B) Streak
   C) Size
   D) Hardness

7. **To help determine what kind of rock they have, scientists may _____ a rock to see what color it leaves on a porcelain plate.**

   A) grind
   B) paint
   C) break open
   D) streak

8. **Scientists may use the _____ hardness scale to determine how hard a rock is.**

   A) Rock
   B) Geo
   C) Mohs
   D) Mineral

9. **If a rock scores a 1 on the above scale, it is incredibly hard and cannot be scratched easily.**

   A) True
   B) False

19 ROCK ON!

Rocks are getting recycled all the time, both up on the surface and deep underground, sometimes very quickly, other times very slowly. We'll be examining the three types of rocks and the cycle God uses to recycle them over and over again throughout history.

Recommended Reading

- *The Geology Book*, by John Morris, Chapter 2
- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 42-57
- *Minerals, Rocks, and Soil*, by Barbara Davis, pp. 22-37
- *Rocks, Minerals, and Soil*, by Susan Markowitz, Chapters 2 & 5
- *Rocks, Rivers, and the Changing Earth: A First Book about Geology*, by Herman Schneider and Nina Schneider, Chapter 8

ACTIVITY Model Crayon Rocks

Take a closer look at the rock cycle and examine how each of the three types of rocks are formed: beginning with crayon sediment, and transforming into sedimentary, metamorphic, and igneous rocks.

SUPPLIES

- Crayon shavings
- Aluminum foil
- Candle
- Match or lighter
- Clothespin

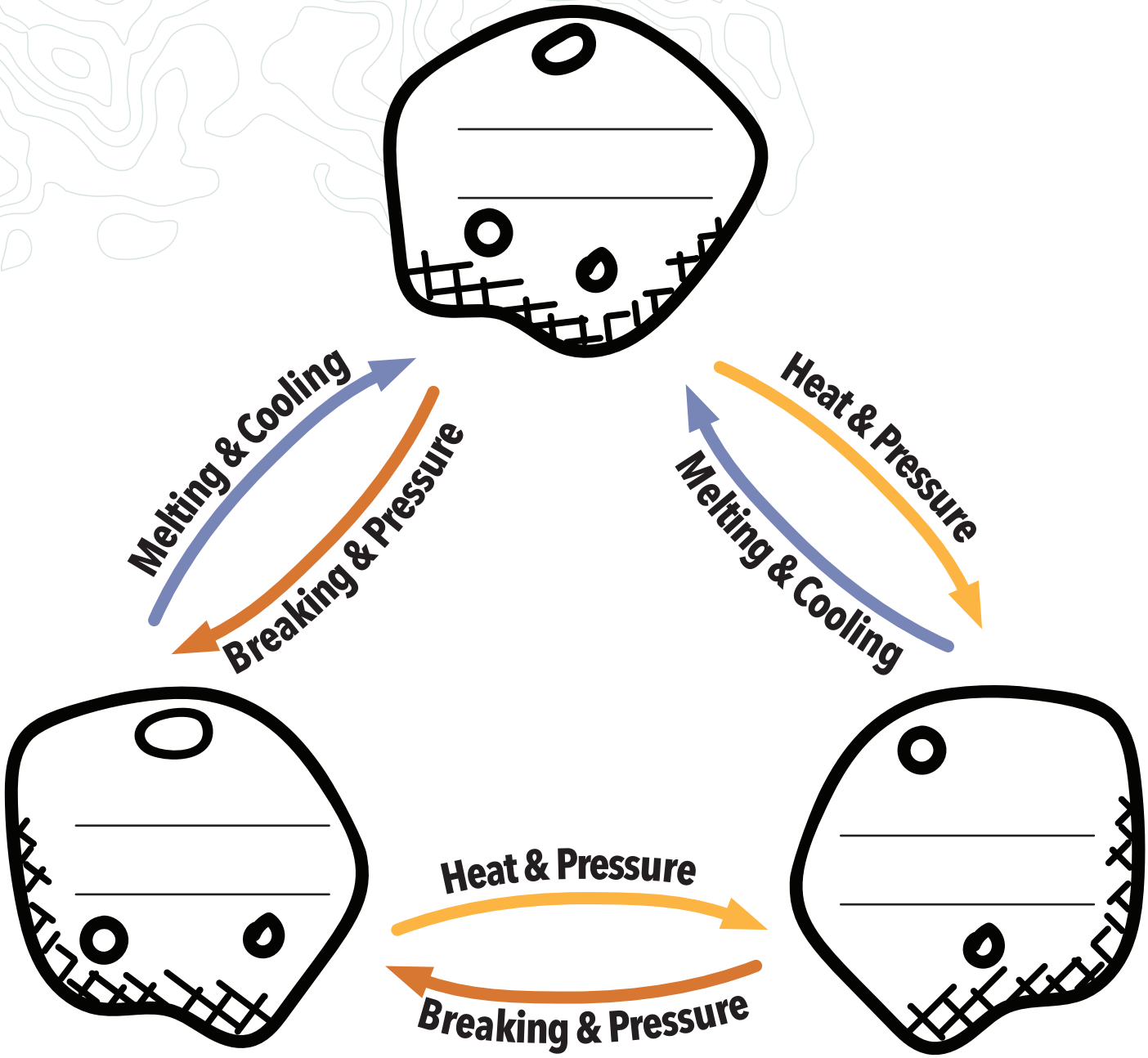
NOTE: Please be sure you have an adult help you with this lab as you'll be working with fire.

INSTRUCTIONS

1. Look at the diagram on the following chart to review the rock cycle. Consider how each type of rock is formed and fill in the names of the rocks.
2. Make crayon sediment by creating crayon shavings of several colors of crayons. You can do this using a crayon sharpener or a cheese grater.
3. Cut a piece of aluminum foil about 12 inches long. Pile several colors of your crayon sediment on top of one another in the middle of the foil.
4. Fold the foil so the crayon sediment is contained within it.
5. Apply pressure to your crayon sediment by pushing on the foil firmly with the palm of your hand. You may want to put your foil packet on the floor and stomp on the foil or use a pan to put pressure on your sediment.
6. When your crayon pieces are pressed together, examine them. You've created a model of crayon sedimentary rock.

INSTRUCTIONS, CONTINUED

7. Light your candle. This will serve as your heat source.
8. Wrap your crayon sedimentary rock back in the aluminum foil.
9. Attach a clothespin to the foil to be used to hold on to the packet while you briefly apply heat to the outside of the foil. Apply just enough heat to slightly soften the crayon sedimentary rock, but do not melt it.
10. Again, apply pressure to the foil packet. Push firmly on the foil packet or stomp on the packet.
11. Open your packet up and examine your new rock. By applying heat and pressure, you've changed your rock model to metamorphic rock.
12. Wrap your crayon metamorphic rock back in the aluminum foil. Be sure it's securely wrapped. You may want to wrap an extra layer of aluminum foil around your packet.
13. Attach a clothespin to the foil and hold it over the candle for several minutes until the model crayon rock melts.
14. Allow the crayon to cool completely. By melting your model rock and allowing it to cool, you've changed your rock model to igneous rock.


Melting & Cooling
Breaking & Pressure
Heat & Pressure
Melting & Cooling
Heat & Pressure
Breaking & Pressure

LESSON 19: ROBERT DUNCAN

We haven't found many very old rocks on Earth because our planet's surface is constantly renewed by plate tectonics coupled with erosion.

We haven't found many very old rocks on Earth because our planet's surface is constantly renewed by plate tectonics coupled with erosion.

LESSON 19: ROBERT DUNCAN

Lesson 19 Quiz

1. **Rocks are destroyed over time and are not able to be recycled.**

   A) True
   B) False

2. **What do we call hot, liquid rock that's come to the surface?**

   A) Molten
   B) Lava
   C) Magma
   D) Mineral soup

3. **What kind of rock is formed when a liquid rock cools down into a solid?**

   A) Igneous
   B) Sedimentary
   C) Granite
   D) Firestone

4. **Rocks can change when they are put under pressure or heat.**

   A) True
   B) False

5. **What do we call tiny bits of rock that often settle at the bottom of water?**

   A) Sandstone
   B) Sediment
   C) Aquastone
   D) Stationary

6. **What new type of rock is formed when layers of bits of rocks become packed down and cemented together?**

   A) Igneous
   B) Sedimentary
   C) Granite
   D) Waterstone

7. **What new types of rocks are formed when rocks are exposed to heat and pressure?**

   A) Sedimentary
   B) Magmous
   C) Sandstone
   D) Metamorphic

8. **The rock cycle can only take place over a very short period of time.**

   A) True
   B) False

THE PLATES OF THE EARTH

While it may seem like the ground you're standing on is stationary, it's not. You'll learn in this lesson how the earth's crust is broken up into pieces and those pieces are constantly moving and shifting, floating on top of the earth's mantle.

Recommended Reading

- *Earth's Crust*, by Conrad Storad, Chapter 2
- *Plate Tectonics*, by Eileen Greer
- *Plate Tectonics*, by Jason D. Nemeth
- *Plate Tectonics and Disasters*, by Tom Greve, Chapters 1 & 2
- *Scientists Who Changed History*, by DK, p. 205: Alfred Wegener

ACTIVITY Orange Earth

The earth's outer crust is composed of rigid pieces that move. These are called tectonic plates. In this activity, you'll be able to see how these plates fit together on the spherical surface of the earth.

SUPPLIES

- Orange
- Toothpicks
- Clay or playdough

INSTRUCTIONS

1. Find a round orange that peels easily.
2. Peel the orange with just your fingers, trying to make the pieces as large as possible (about 4-5 pieces). The peeled edges will be jagged and may tear. That's okay.
3. The orange represents the earth and the pieces of peel represent the plates that are part of the crust. Compare the shape of your orange to the individual pieces.
4. Place the peel back onto the orange. Use toothpicks to hold the plates on the orange.
5. Notice the boundaries between the peels. These cracks are places where the plates rub up against one another, move into one another, or pull away from one another.
6. Cover the entire orange with a thin piece of clay or playdough. This playdough represents the dirt and water covering the plates.

LESSON 20: ALFRED WEGENER

The forces which displace continents are the same as those which produce great fold mountain ranges.

The forces which displace continents are the same as those which produce great fold-mountain ranges.

LESSON 20: ALFRED WEGENER

Lesson 20 Quiz

1. **The theory of continental drift was well received by all scientists.**

   A) True
   B) False

2. **Where does most of the rock cycle occur?**

   A) On the surface of the earth
   B) In the atmosphere
   C) Deep in the earth
   D) In the water

3. **What are the puzzle-like pieces that the crust is broken into?**

   A) Tectonic plates
   B) Crust plates
   C) Ocean plates
   D) Earth plates

4. **What is the name given to the plates that the continents sit on?**

   A) Earth plates
   B) Land plates
   C) Country plates
   D) Continental plates

5. **The oceans mostly sit on plates called oceanic plates.**

   A) True
   B) False

6. What are the edges where two plates meet called?

A) Trenches
B) Boundaries
C) Ranges
D) Tectonic sides

7. What is being caused by the ocean floor spreading apart?

A) Continents are being pushed apart
B) Islands are being formed
C) The oceans are getting shallow
D) Mountains are forming

8. What scientific theory proposes that the earth's crust is broken into several pieces?

A) The theory of Earth plates
B) The Pangaea theory
C) The theory of continental drift
D) The theory of plate tectonics

9. The seven continents are Asia, Africa, North America, South America, Antarctica, Europe, and Australia.

A) True
B) False

WHO'S AT FAULT?

When two or more tectonic plates meet, we have a boundary. These boundaries interact with one another in different ways causing many of the features we see on Earth and a number of natural disasters we experience as well. We'll continue to explore plate tectonics and the movements of convergent, divergent, and transform boundaries.

Recommended Reading

- *The Geology Book*, by John Morris, Chapter 4, pp. 44-46
- *Earth's Crust*, by Conrad Storad, Chapters 3 & 4
- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 10-11
- *Rocks, Rivers, and the Changing Earth: A First Book About Geology*, by Herman Schneider and Nina Schneider, Chapter 11
- *Plate Tectonics and Disasters*, by Tom Greve, Chapter 3

ACTIVITY Tasty Tectonics

In this activity, you'll be using graham crackers and frosting to display how the plates of the earth interact at their boundaries. And maybe after you're done, you can enjoy a tasty treat!

SUPPLIES

- 3 plates
- Graham crackers
- Frosting

INSTRUCTIONS

1. Cover your plate with a layer of frosting. The frosting represents magma underneath the surface of the crust.
2. Divide six graham crackers into three pairs. Each should have a long side and a short side. The graham crackers represent the earth's plates.

Boundary #1

3. Place the first two graham crackers with the short sides next to one another so they are touching.
4. Gently press down on the graham crackers and slowly pull them in opposite directions until there's a small gap between them with frosting oozing through the opening.
5. Observe what happens. Notice how the magma frosting comes to the surface to fill in the gap between the plates. In the box on the following page, sketch what your plate looks like and identify the type of boundary.

INSTRUCTIONS, CONTINUED

Boundary #2

6. Remove the graham crackers from your plate and smooth out the frosting. You may add more frosting to your plate if needed.

7. Place the next two graham crackers so that their short sides are close to one another, but leaving a small gap.

8. Gently press down on the graham crackers and slowly move them into one another.

9. Observe what happens. One graham cracker might move under the other one, or both graham crackers may crumble at their edges. In the box on the following page, sketch what your plate looks like and identify the type of boundary.

Boundary #3

10. Remove the graham crackers from your plate and smooth out the frosting. You may add more frosting to your plate if needed.

11. Place the next two graham crackers with the long sides next to one another so they are touching.

12. Push the pieces together while sliding them in opposite directions. While you're sliding them in opposite directions, also push the graham crackers towards one another.

13. Observe what happens. If done correctly, the graham cracker will eventually break. In the box on the following page, sketch what your plate looks like and identify the type of boundary.

BOUNDARY #1

What type of boundary does this represent? _____

BOUNDARY #2

What type of boundary does this represent? _____

BOUNDARY #3

What type of boundary does this represent? _____

LESSON 21: ÉMILE ARGAND

... structures that build a tectonic construction do not represent the whole picture: there is also the movement that animated and still animates these bodies ...

... structures that build a tectonic construction do not represent the whole picture: there is also the movement that animated and still animates these bodies ...

LESSON 21: ÉMILE ARGAND

WHO'S AT FAULT?

Lesson 21 Quiz

1. **What happens at a convergent boundary?**

   A) Plates slide beside each other
   B) Plates push into each other
   C) One plate slides under the other
   D) Plates stop moving

2. **The movement of tectonic plates does not cause any changes on the surface of the earth.**

   A) True
   B) False

3. **What is often formed when two continental plates converge?**

   A) Rivers
   B) Gorges
   C) Mountains
   D) Caves

4. **What is often formed when two oceanic plates converge?**

   A) Trenches
   B) Gorges
   C) Mountains
   D) Caves

5. **When a continental and an oceanic plate converge, what frequently forms?**

   A) Rivers
   B) Volcanoes
   C) Mountains
   D) Caves

6. **Which type of boundary occurs when two plates are moving apart?**

A) Emergent
B) Convergent
C) Transform
D) Divergent

7. **Which type of boundary is most likely to cause an earthquake?**

A) Emergent
B) Convergent
C) Transform
D) Divergent

8. **What type of boundary occurs when two plates are sliding past one another?**

A) Emergent
B) Convergent
C) Transform
D) Divergent

BLOW YOUR TOP

The movement of the earth's tectonic plates causes some of the world's most destructive disasters. In this lesson, we'll be taking a look at volcanoes. We'll explore how the movements of the plates cause lava to spew from the earth, throwing rocks, ash, and gases with it.

Recommended Reading

- *The Geology Book*, by John Morris, Chapter 4, pp. 42-43
- *Vacation Under the Volcano*, by Mary Pope Osborne
- *Hill of Fire*, by Thomas P. Lewis
- *Volcanoes*, by Franklyn M. Branley
- *Volcanoes*, by Gail Gibbons
- *Volcanoes*, by Seymour Simon
- *Women in Science: 50 Fearless Pioneers Who Changed Science*, by Rachel Ignotofsky, p. 107: Katia Krafft

ACTIVITY Volcanic Eruptions!

Not all volcanoes are the same size or shape. And they don't stay the same either; they actually grow and change over time. This activity will allow you to build a model volcano and watch how they change as they erupt and new rock is built upon the existing volcanic structure.

SUPPLIES

- 5 colors of playdough
- Dental floss
- Paper plate (optional)

PRE-ACTIVITY QUESTIONS

1. What is magma called after it comes to the surface of the earth?

   _____

2. What type of rock does lava form when it cools?

   _____

INSTRUCTIONS

1. Build a small model volcano using playdough on a paper plate. The volcano should be about 3-4 inches tall and 3-4 inches wide.
2. Pretend your volcano erupted and covered the entire mountain with lava. Create a layer of playdough in a different color to represent the lava and cover your volcano with it.
3. Pretend your volcano had three more eruptions, following the directions in step 2.
4. Using a piece of dental floss, cut your volcano in half. You should be able to see your original volcanic structure and each of the new layers created from the lava. Do you see how over time volcanoes can grow and change in structure?

LESSON 22: MICAH 1:4

And the mountains will melt under him,
and the valleys will split open, like wax before
the fire, like waters poured down a steep place.

LESSON 22: MICAH 1:4

And the mountains will melt under him, and the valleys will split open, like wax before the fire, like waters poured down a steep place.

LESSON 22: MICAH 1:4

Lesson 22 Quiz

1. **What is an opening in the earth's crust where gases, lava, rock, and ash flow through?**

   A) Gully
   B) Volcano
   C) Cave
   D) Tectonic plate

2. **What types of boundaries do volcanoes occur at?**

   A) Convergent and divergent
   B) Just divergent
   C) Transform and convergent
   D) Divergent and transform

3. **Volcanoes all have the same tall, cone shape.**

   A) True
   B) False

4. **What is magma called when it reaches the crust?**

   A) Molten
   B) Igneous rock
   C) Lava
   D) Ash

5. **Where are most volcanoes located?**

   A) Underground
   B) On top of the crust
   C) In forests
   D) Deep in the ocean

6. **When volcanoes erupt many times under water, they can eventually form:**

A) trenches
B) islands
C) lava caves
D) coral reefs

7. **What do we call the place where 75% of the earth's volcanoes are located?**

A) The Ring of Fire
B) Volcanic ring
C) Smoke circle
D) Ring of volcanoes

8. **When a volcano erupts, lava and smoke are the only things that come out.**

A) True
B) False

9. **What is one positive impact volcanoes can have after they erupt?**

A) They will never erupt again
B) They become safe for people to explore
C) The land near the volcano becomes good for growing crops
D) They clean the air around them

SHAKE, RATTLE, & ROLL

Earthquakes can be so small you might not even feel them or large enough to topple buildings. These vibrations caused by the shifting of the tectonic plates of the earth's crust are the focus of this week's lesson.

Recommended Reading

- *Earthquakes*, by Franklyn M. Branley
- *The Ultimate 10 Natural Disasters: Earthquakes*, by Anna Prokos
- *Earthquakes: Disaster and Survival*, by Jennifer Reed
- *Danger! Earthquakes*, by Seymour Simon
- *Plate Tectonics and Disasters*, by Tom Greve, Chapters 4 & 5
- *Scientists Who Changed History*, by DK, p. 22: Zhang Heng

ACTIVITY Seismograph Simulation

A seismograph is a tool used by scientists to measure the intensity of the waves experienced on Earth that are created by earthquakes. A seismograph records waves on a piece of paper we call a seismogram. With the help of a parent or other adult, you'll see how seismographs work and create a seismogram of a car ride.

SUPPLIES

- Felt pen
- Notepad with lined paper
- Ruler
- Parent or another adult
- Car

INSTRUCTIONS

1. Ask a parent or another adult for help with this activity. They'll need to take you for a short car ride. You'll need to sit in one of the passenger seats of the car.
2. Extend the pad of paper and place it against the dashboard or seatback and hold it there.
3. With your other hand, place your pen tip on the surface of the paper.
4. As the driver begins to accelerate, slowly move your hand across the surface of the notepad creating a straight line.
5. As you hit bumps in the road, your hand will move up and down, so your line will become wavy. The pen you are holding records the movements you experience, much like a seismograph records the movement of Earth.
6. Take a different route home and repeat this procedure on a new piece of paper.
7. Pay attention to whether the route away from your home or the route back to your home felt bumpier to you and record your answer below.
8. When you get home, compare your seismograms and answer the questions below. Measure the distance between the highest peaks and valleys in each of your seismograms using a ruler.

Questions

Which route felt bumpier to you? _____

_____

Which seismogram had more peaks and valleys? _____

_____

Which seismogram had the highest peaks and valleys? _____

_____

LESSON 23: CHARLES LYELL

It must have appeared almost as improbable to the earlier geologists, that the laws of earthquakes should one day throw light on the origin of mountains ...

It must have appeared almost as improbable to the earlier geologists, that the laws of earthquakes should one day throw light on the origin of mountains ...

LESSON 23: CHARLES LYELL

Lesson 23 Quiz

1. **What causes earthquakes?**

   A) Tectonic plates shifting
   B) Volcanic eruptions
   C) Mountains crumbling
   D) Waves hitting land

2. **Which type of boundary do MOST earthquakes occur at?**

   A) Convergent
   B) Divergent
   C) Transform
   D) Emergent

3. **All earthquakes are large and can be felt by people.**

   A) True
   B) False

4. **What is the study of earthquakes?**

   A) Shakeology
   B) Seismology
   C) Quakeology
   D) Earthquakeology

5. **What type of boundary do the most powerful megathrust earthquakes happen at?**

   A) Emergent
   B) Divergent
   C) Transform
   D) Convergent

6. **Where do most earthquakes originate from?**

   A) The Ring of Fire
   B) Alaskan mountains
   C) The San Andreas fault
   D) North America

7. **Earthquakes do not just happen at boundaries, but can also be felt in the middle of tectonic plates.**

   A) True
   B) False

8. **What is the central spot on the surface of the earth where an earthquake's vibrations come from, where it feels the strongest?**

   A) Central damage spot
   B) Seismospot
   C) Epicenter
   D) Seismograph

9. **What scale do seismologists use to rate the intensity of earthquakes?**

   A) Shake scale
   B) Richter scale
   C) Vibration intensity scale
   D) Rebound scale

24 WALL OF WATER

Tsunamis are giant walls of water that strike land and destroy everything in their path. We'll be exploring the causes of these devastating, colossal waves in this lesson of Earth Science Explored Elementary.

Recommended Reading

- *It's a Tsunami!*, by Nadia Higgins
- *The Science of a Tsunami*, by Robin Koontz
- *Disaster Zone Tsunamis*, by Cari Meister
- *Tsunamis and Floods*, by Joanna Brundle

ACTIVITY Mapping Tsunamis

Disasters like earthquakes, volcanoes, and landslides are caused by the movements and interactions of tectonic plates, and can cause massive, dangerous waves at coastlines. These tsunami waves radiate out from the center of the disaster causing destruction at the coastlines of surrounding regions. In this activity, you'll see the regions impacted by tsunamis that occur as a result of earthquakes, volcanoes, and landslides.

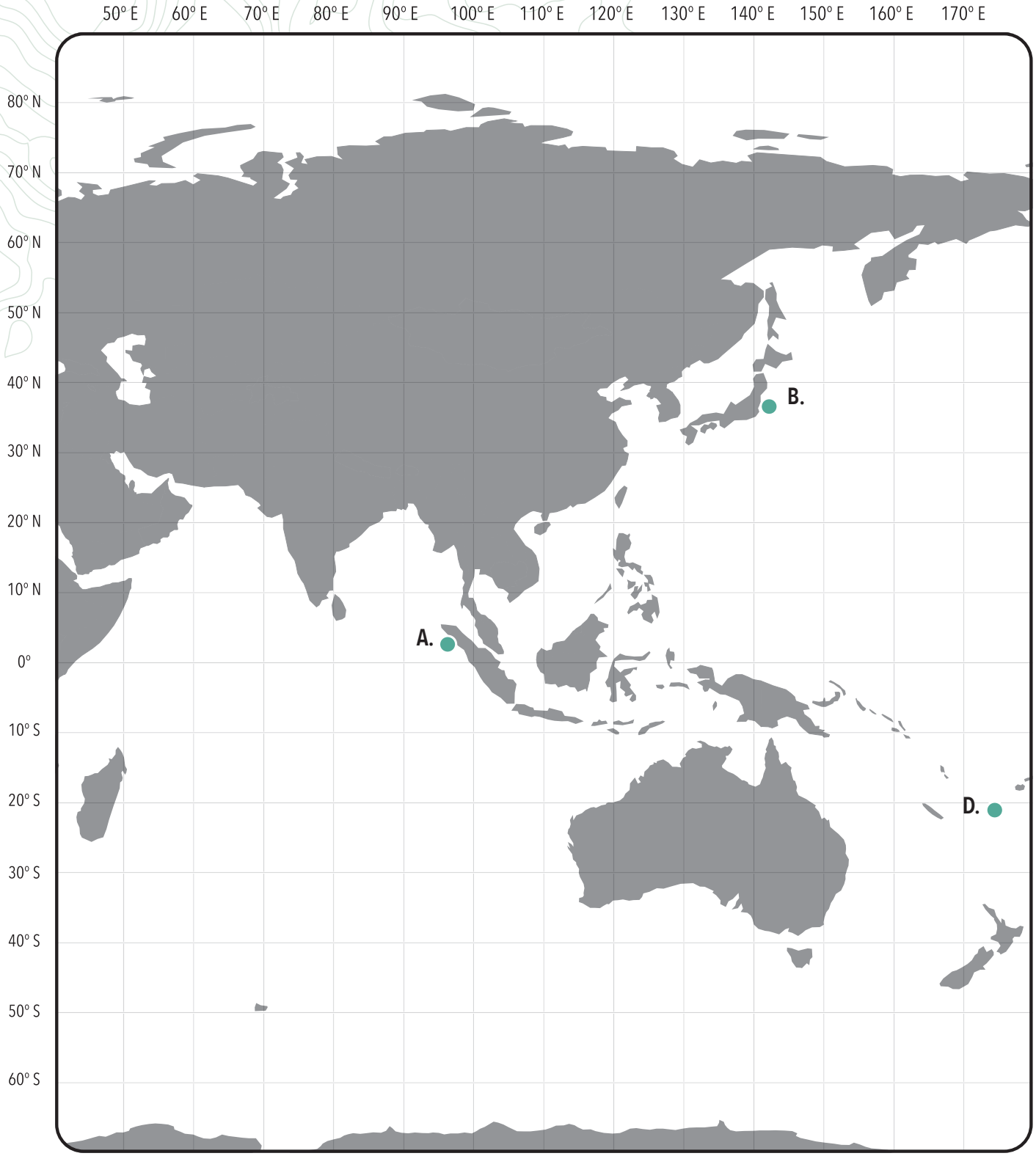
SUPPLIES

- Colored pencils

INSTRUCTIONS

1. Look at the map on the following pages. You'll see four different locations where natural disasters occurred, such as an earthquake, a volcanic eruption, or a landslide. Following each disaster was a tsunami. Each disaster is also listed in the table below.
2. Look at the first natural disaster. The 2004 Indian Ocean earthquake is A on the table below. You can find the letter A on your map to denote that is where the epicenter of the earthquake was located.
3. Look at the table below to see the regions most impacted by earthquake A.
4. Use a colored pencil to shade on the map the coastlines of the regions most impacted by the tsunami waves following the natural disaster. You may use a physical map or online map to help you find these locations.
5. Continue to use the provided table and map to shade regions where significant damage occurred because of other tsunamis. Use a different colored pencil for each tsunami.

	Coastlines where significant damage occurred
A. 2004 Indian Ocean earthquake	Indonesia, Sri Lanka, Thailand, India, Andaman, Nicobar Islands, Maldives, and Somalia
B. 2011 Tōhoku earthquake	Pacific coast of Japan; west coast of Oregon USA; Vancouver Island, British Columbia, Canada; north coast of Papua and Papua New Guinea
C. 2015 Icy Bay, Alaska landslide	Icy Bay, Alaska USA
D. 2022 Hunga Tonga–Hunga Ha'apai volcano eruption	Tonga, Fiji, New Zealand, Peru, Northern Chile


50° E
60° E
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80° E
90° E
100° E
110° E
120° E
130° E
140° E
150° E
160° E
170° E
80° N
70° N
60° N
50° N
40° N
30° N
20° N
10° N
0°
10° S
20° S
30° S
40° S
50° S
60° S
A.
B.
D.


170° W
160° W
150° W
140° W
130° W
120° W
110° W
1000° W
90° W
80° W
70° W
60° W
50° W
80° N
70° N
60° N
50° N
40° N
30° N
20° N
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10° S
20° S
30° S
40° S
50° S
60° S
C.

LESSON 24: ISAIAH 51:15

I am the Lord your God, who stirs up the sea so that its waves roar—the Lord of hosts is his name.

LESSON 24: ISAIAH 51:15

I am the Lord your God, who stirs
up the sea so that its waves roar—
the Lord of hosts is his name.

Lesson 24 Quiz

1. **Tsunamis are giant, dangerous waves, but they typically do not reach land or cause any destruction.**

   A) True
   B) False

2. **What event causes the MOST tsunamis?**

   A) Volcanic eruptions
   B) High wind speeds
   C) Earthquakes
   D) Landslides

3. **Where do tsunamis cause destruction?**

   A) Just the sand at the beach
   B) Up to miles inland from the ocean
   C) They do not cause destruction
   D) Only land very near to the earthquake

4. **Tsunamis can be caused indirectly by other events such as landslides, volcanic eruptions, or even large amounts of rock falling in the ocean.**

   A) True
   B) False

5. **How fast can tsunamis move?**

   A) Up to 10 miles per hour
   B) Up to 25 miles per hour
   C) Up to 100 miles per hour
   D) Up to 500 miles per hour

6. **Where do we have sensors that can alert us if a tsunami is coming?**

A) On the seafloor
B) On volcanoes
C) At each plate boundary
D) On the beach

BREAK IT DOWN

In this lesson, we'll learn about powerful processes that shape the earth we live on—weathering and erosion. From unique rock formations, to huge trenches and vast sand dunes, the evidence of weathering and erosion is all around us.

Recommended Reading

- *The Geology Book*, by John Morris, Chapter 4, pp. 28-37
- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 12-14
- *Erosion*, by Joelle Riley
- *Examining Erosion*, by Joelle Riley
- *Rocks, Rivers, and the Changing Earth: A First Book About Geology*, by Herman Schneider and Nina Schneider, Chapters 2 & 5
- *Shaping the Earth: Erosion*, by Sandra Downs

ACTIVITY Erosion in Your Neighborhood

Weathering is the process of rocks being broken down, and erosion is the process of those bits of rock being carried away. These processes are happening all around you and you probably haven't even noticed it. In this activity, you'll be searching for signs of weathering and erosion right where you live.

SUPPLIES

- 1-gallon jar or jug
- 4 smaller jars or bowls
- Measuring cups and spoons
- Food coloring (optional)
- Water
- Salt
- Pipette or eyedropper

INSTRUCTIONS

1. Go for a walk or several walks this week and look for signs of weathering and erosion.
2. See the list of signs of weathering and erosion on the following checklist. Check off all of the things you can find.
3. If you live in an area with other signs of weathering and erosion not listed, like canyons, gorges, mesas, waterfalls, caves, or other unique features, be sure to add them to your list!

SIGNS OF WEATHERING & EROSION

Soil with no grass

Exposed tree roots

Sidewalk or pavement that's crumbling or has cracks

Dust blowing in the air

Sand or gravel

Pooling water

Holes or indents from water regularly hitting the same spot

Damaged bricks

Rocks or pebbles piled in one place by water

Sand dunes or other signs of erosion near a beach

Gravestones with lettering worn away

Rocks with holes or cracks

Outdoor sculptures with worn areas

LESSON 25: JOSEPH NEILSON

We stand by the river ... it gathers volume and force, makes its way through the gorges of the mountains, plows, widens and deepens its channel ...

We stand by the river ... it gathers volume and force, makes its way through the gorges of the mountains, plows, widens and deepens its channel ...

LESSON 25: JOSEPH NEILSON

BREAK IT DOWN

Lesson 25 Quiz

1. **What is the gradual breakdown of rocks over time?**

   A) Erosion
   B) Weathering
   C) Friction
   D) Transformation

2. **What type of weathering occurs when things are hitting, scraping, or rubbing against a rock?**

   A) Physical
   B) Erosion
   C) Chemical
   D) Biological

3. **What type of weathering occurs when something acidic touches rock and breaks it down?**

   A) Physical
   B) Biological
   C) Chemical
   D) Erosion

4. **A tree root growing through a rock is an example of chemical weathering.**

   A) True
   B) False

5. **What is the picking up and moving of rocks or dirt from one place to another?**

   A) Erosion
   B) Weathering
   C) Friction
   D) Transformation

6. What are the two main ways rocks are eroded?

A) People breaking rocks and wind
B) Hurricanes and tornadoes
C) Rain and hail
D) Wind and water

7. Most of the time, weathering and erosion happen very slowly.

A) True
B) False

CLEAR AS MUD

Dirt might not seem like anything special, but it's vital for life. In this lesson, you'll explore what soil's made of, the five factors that are responsible for making soil unique in different locations, and why we need soil.

Recommended Reading

- *Minerals, Rocks, and Soil*, by Barbara Davis, pp. 38-43
- *Rocks, Minerals, and Soil*, by Susan Markowitz, Chapter 4
- *Jump Into Science: Dirt*, by Steve Tomecek
- *Discover Dirt*, by Pamela Hall
- *Soil, Silt, and Sand: Layers of the Underground*, by Jody Sullivan Rake
- *Digging on Dirt*, by Rena Korb

ACTIVITY Exploring Dirt

Let's look at dirt in a way you've never looked at it before! In this activity, you'll closely examine soil to see that it's made up of many different organic and inorganic components.

SUPPLIES

- 1 cup of rich soil from a garden (preferably from outside, not a store)
- Cookie sheet
- Tweezers
- Hand lens

INSTRUCTIONS

1. Place a cup of rich soil in a bowl so you can examine the soil, the richer the soil the better.
2. Pick up a handful of soil and consider how it feels in your hands. Observe how your soil smells.
3. Spread your soil out on a cookie sheet and examine it closely. What are the size and shape of the particles of your soil? What colors do you see?
4. Use your hands and tweezers to separate the materials you find in your soil. Place the organic (living or once living things) and the inorganic (non-living things) each in separate piles. Organic materials can be bits of plants, bark from trees, living bugs or worms, etc. Inorganic materials can be sand, rocks, clay, etc.
5. Use a hand lens to examine the materials carefully.

LESSON 26: LUKE 8:15

As for that in the good soil, they are those who,
hearing the word, hold it fast in an honest
and good heart, and bear fruit with patience.

LESSON 26: LUKE 8:15

As for that in the good soil, they are those who, hearing the word, hold it fast in an honest and good heart, and bear fruit with patience.

LESSON 26: LUKE 8:15

CLEAR AS MUD

Lesson 26 Quiz

1. **What is soil made of?**

   A) Minerals
   B) Water
   C) Organic matter
   D) All of the above

2. **When rocks break down, what tiny particles do they contribute to the soil?**

   A) Minerals
   B) Organic matter
   C) Pores
   D) Water

3. **What is the part of the soil that is made up of broken down particles of once-living things?**

   A) Minerals
   B) Organic matter
   C) Pores
   D) Silt

4. **What holds gases and water in the soil?**

   A) Minerals
   B) Organic matter
   C) Pores
   D) Silt

5. **Parent material, climate, the type of organic material, topography, and time are all important reasons why soil is different from place to place.**

   A) True
   B) False

6. **Where are you most likely to find deep, rich soil?**

A) The bottom of a mountain
B) In the desert
C) The top of a mountain
D) Next to a glacier

7. **Soil can help purify _____ and _____.**

A) food; water
B) air; sand
C) air; water
D) wind; crops

8. **What is the main reason soil is so important?**

A) Animals live there
B) Plants grow in soil
C) It cleans the air
D) We can build on it

9. **We call things that are alive or once alive:**

A) soil
B) organic
C) inorganic
D) parent material

RELICS OF THE PAST

Fossils are exciting because they give us clues as to what the world was like long before we were on Earth. Come explore this thrilling topic with us as we dig up fun facts about the different types of fossils we find hidden here on Earth.

Recommended Reading

- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 104-117
- *I Really, Really, Really Like Fossils*, by Ruth Carter
- *The Geology Book,* by John Morris, Chapter 4, pp. 38-41
- *Fossils Tell Stories*, by Yu-ri Kim
- *Women in Science: 50 Fearless Pioneers who Changed Science*, by Rachel Ignotofsky, p. 15: Mary Anning
- *Stone Girl Bone Girl: A Story of Mary Anning of Lyme Regis*, by Laurence Anholt

ACTIVITY Creating Fossil Replicas

While fossils often take a long time in nature to be created, we can easily create a replica of a fossil with materials from around our house.

SUPPLIES

- 1 cup flour
- 1 cup used coffee grounds
- ½ cup salt
- ½ cup cold coffee
- Waxed paper
- 4 small items like a twig, a shell, a small toy, etc.

INSTRUCTIONS

1. Combine the flour, coffee grounds, salt, and cold coffee in a bowl. Mix well and knead with your hands until it's well combined and the dough is smooth.
2. Divide the dough into four pieces. Roll each piece into a ball.
3. Place each of your dough balls on a piece of wax paper and flatten the dough balls with your hand.
4. Press a small item into each of your flattened pieces of dough. Carefully remove the objects.
5. Set the dough pieces aside for a day to dry.
6. Observe your fossils after they've had a chance to dry. Show them to a friend or family member and explain to them what this type of fossil is and how it differs from other types of fossils.

QUESTIONS

What type of fossils did you create in this activity? _____

What type of fossil is created when an exact replica of something is created from minerals? _____

What type of fossils are created when we find the original body parts of an animal?

_____

LESSON 27: ERNST FRIEDRICH

Where could the naturalist seek for more telling documents of the history of creation than in the fossils themselves?

Where could the naturalist seek for more telling documents of the history of creation than in the fossils themselves?

LESSON 27: ERNST FRIEDRICH

Lesson 27 Quiz

1. **Remains or impressions left by once-living things are called:**

   A) imprints
   B) amber
   C) bones
   D) fossils

2. **Only bones can become fossils.**

   A) True
   B) False

3. **What type of rocks are most fossils found in?**

   A) Igneous
   B) Sedimentary
   C) Metamorphic
   D) Transitional

4. **Fossils that give proof that a living thing was in an area are called:**

   A) trace fossils
   B) preserved remains
   C) petrified remains
   D) impressions

5. **What type of fossil is created where the indent of the animal is left behind?**

   A) Trace fossils
   B) Preserved remains
   C) Petrified remains
   D) Impressions

6. What type of fossil is a replica of the original living thing made of minerals?

A) Trace fossils
B) Preserved remains
C) Petrified remains
D) Impressions

7. What type of fossil is created when you see an impression of a leaf that was once there?

A) Trace fossils
B) Preserved remains
C) Petrified remains
D) Impressions

8. What kind of fossil is an ant stuck in amber?

A) Trace fossils
B) Preserved remains
C) Petrified remains
D) Impressions

9. What kind of fossil is a footprint of a dinosaur preserved in rock?

A) Trace fossils
B) Preserved remains
C) Petrified remains
D) Impressions

28 ALL OVER THIS LAND

From mountains and hills to plateaus and plains to mesas and canyons—the earth is covered in unique landforms. In this lesson, you'll learn about many of the unique landforms created from the movements of the earth's plates, along with weathering and erosion.

Recommended Reading

- *Rock Collecting for Kids*, by Dan R. Lynch, pp. 15-23
- *The Geology Book*, by John Morris, Chapter 3
- *Erosion and Sinkholes*, by Joanna Brundle
- *Canyons*, by Lisa J. Amstutz

ACTIVITY Drawing Landforms

There are four major landforms—mountains, hills, plateaus, and plains—that take up the most space on Earth. There are also many different minor landforms creating beauty and diversity on this land. In this activity, you'll show off your art skills and draw six different landforms!

SUPPLIES

- Colored pencils or crayons

INSTRUCTIONS

1. On the following pages, there are boxes for six different landforms. Draw pictures to illustrate the four major landforms in the labeled boxes.
2. In each of the two remaining boxes, draw a minor landform that interests you. You may choose from any of the following, or choose a minor landform that's not listed.
   - Canyon
   - Butte
   - Cave
   - Valley
   - Basin
3. Label the two minor landforms you drew.
4. Be sure to email us a picture of you with your landforms or share it with us on Facebook or Instagram!

MOUNTAIN

HILL

PLATEAU

PLAIN

LESSON 28: PSALM 104:31-32

May the glory of the Lord endure forever;
may the Lord rejoice in his works, who looks
on the earth and it trembles, who touches the
mountains and they smoke!

LESSON 28: PSALM 104:31-32

May the glory of the Lord endure forever; may the Lord rejoice in his works, who looks on the earth and it trembles, who touches the mountains and they smoke!

LESSON 28: PSALM 104:31-32

Lesson 28 Quiz

1. **Which of the following is NOT a landform?**

   A) Mountain
   B) Ocean
   C) Hill
   D) Plain

2. **What is the word for how the land is arranged with all its physical features?**

   A) Biography
   B) Topography
   C) Cartography
   D) Bibliography

3. **Minor landforms take up a lot of space on Earth.**

   A) True
   B) False

4. **What type of landforms have steep slopes that stick up abruptly from the ground with high peaks?**

   A) Mountains
   B) Plateaus
   C) Plains
   D) Hills

5. **What type of landforms are smaller than mountains and are typically formed from tectonic plate movement and shaped by weathering and erosion?**

   A) Mountains
   B) Plateaus
   C) Plains
   D) Hills

6. **What type of landforms are raised flat areas?**

A) Mountains
B) Plateaus
C) Plains
D) Hills

7. **What type of landforms are large, flat, wide stretches of land that just go on and on?**

A) Mountains
B) Plateaus
C) Plains
D) Hills

INTO THE LAND

In this lesson, you'll discover a whole new world under your feet. We'll journey deep underground to explore caves and learn about their unique features and how they are formed through the process of erosion.

Recommended Reading

- *Caves and Caverns*, by Gail Gibbons
- *Caves*, by Lisa J. Amstutz

ACTIVITY Growing Stalactites & Stalagmites

Stalactites and stalagmites are formations found within caves that are formed from mineral-rich water seeping through the rocks. As this water drips into the caves, small amounts of minerals are left behind and accumulate on the roof and floor creating beautiful displays. You'll create a replica of these cave formations using water and a mineral you can easily find at the store, Epsom salts.

SUPPLIES

- 2 small glass jars of the same size (half pint mason jars or similar)
- 2 large paper clips or metal washers
- Cookie sheet
- Epsom salts
- Natural fiber string (cotton butcher string works well)

INSTRUCTIONS

1. Fill each jar about ¾ full with hot water. Place the jars on a cookie sheet 3-5 inches apart from one another.
2. Add enough Epsom salts to create a thick solution. Stir the water so the salts dissolve, plus there should be some still left undissolved on the bottom of the jar.
3. Tie a paper clip or metal washer to the ends of your string. The paper clip or metal washers serve as anchors to hold the string in the water.
4. Place each end into one of the glass jars. There should be some slack in your string, but the string should be at least a couple of inches from the cookie sheet.
5. Place the cookie sheet containing the jars somewhere it will not be disturbed for several days. The Epsom salt formations can easily break if moved.

INSTRUCTIONS, CONTINUED

6. The Epsom salts dissolved in water will move through the string. Once it reaches the middle, the water will begin to drip. As the water evaporates, it will leave behind mineral deposits similar to those you find in caves in the form of stalactites and stalagmites.

7. Sketch a picture of what your setup looks like today on the following page where it says day 0.

8. Each day observe your jars and string and draw a picture of what they look like for eight more days. You may continue to observe your jars for as long as you'd like!

DAY 0

DAY 1

DAY 2

DAY 3

DAY 4

DAY 5

DAY 6

DAY 7

DAY 8

LESSON 29: G.K. CHESTERTON

The second half of human history ... also begins in a cave ... it was here beneath the very feet of the passersby ... that Jesus Christ was born.

The second half of human history ... also begins in a cave ... it was here beneath the very feet of the passersby ... that Jesus Christ was born.

LESSON 29: G.K. CHESTERTON

Lesson 29 Quiz

1. **What landform is a natural hole on the surface of the earth leading to an underground chamber?**

   A) Canyon
   B) Valley
   C) Cave
   D) Mountain

2. **The creation of caves is an example of tectonic plate movement.**

   A) True
   B) False

3. **What kind of cave is formed when the outside of flowing lava cools, leaving behind a hollow tube?**

   A) Volcanic cave
   B) Sea cave
   C) Cavern
   D) Solution cave

4. **This type of cave is created when waves erode the rocky shore and water carves out the land, creating an opening:**

   A) volcanic cave
   B) sea cave
   C) cavern
   D) solution cave

5. **What type of cave is most common, and are some of the largest caves in the world?**

   A) Volcanic cave
   B) Sea cave
   C) Cavern
   D) Solution cave

6. **Many caverns are made out of a type of rock called _____.**

   A) granite
   B) marble
   C) limestone
   D) quartz

7. **Caves continue to change with time and can get bigger.**

   A) True
   B) False

8. **What cave feature is formed by mineral rich water dripping from the ceiling of the cave, forming icicle-like structures out of minerals?**

   A) Stalactites
   B) Caves icicles
   C) Stalagmites
   D) Mineralites

9. **When mineral rich water drips onto the cave floor, cone-like structures called _____ are formed from the minerals.**

   A) stalactites
   B) caves icicles
   C) stalagmites
   D) mineralites

10. **What is formed when a stalactite and stalagmite get so big that they connect?**

    A) Columns
    B) Mineral walls
    C) Corridors
    D) Caverns

UNDER THE WATER

In our last lesson, we'll dive to the bottom of the ocean to take a look at underwater landforms. From undersea mountains to enormous rift valleys and hydrothermal vents, you'll be in awe at God's amazing underwater creations.

Recommended Reading

- *Fountains of Life*, by Elizabeth Gowell
- *The Magic School Bus: On the Ocean Floor*, by Joanna Cole
- *Reaching the Ocean Floor*, by Therese Shea
- *Ocean Speaks: How Marie Tharp Revealed the Oceans Biggest Secret*, by Jess Keating
- *Solving the Puzzle Under the Sea: Marie Tharp Maps the Ocean Floor*, by Robert Burleigh

ACTIVITY Modeling the Seafloor

The seafloor is filled with topographical features just like the land above. Scientists have only recently uncovered what lies at the bottom of the ocean. In this activity, you'll be creating a model of the ocean floor to show off some of the main topographic features found there.

SUPPLIES

- Various art supplies
- Toothpicks
- White paper
- Tape

INSTRUCTIONS

1. Consider what types of supplies you might want to use to create your model of the ocean floor. You could use clay, cardboard, cake, salt dough, or get creative and use something different!
2. Gather your supplies and compose your model of the ocean floor. Be sure to include each of these ocean floor features in your model:
   - Continental shelf
   - Continental slope
   - Abyssal plain
   - Trench
   - Ocean ridge
   - Hydrothermal vent
3. Label each of the ocean floor features using toothpicks with small paper flags attached to them as labels.
4. Once you have completed your model, share with us on Facebook, Instagram, or by email so we can see your creation!

LESSON 30: RACHEL CARSON

When I think of the floor of the deep sea, the single, overwhelming fact that possesses my imagination is the accumulation of sediments.

When I think of the floor of the deep sea, the single, overwhelming fact that possesses my imagination is the accumulation of sediments.

LESSON 30: RACHEL CARSON

Lesson 30 Quiz

1. **What do we call the land underneath the ocean waters?**

   A) Ocean shelf
   B) Sea ground
   C) Ocean floor
   D) Sea shelf

2. **What zone of the ocean has the same kind of landforms as the land it is connected to?**

   A) Continental shelf
   B) Hadal zone
   C) Abyssal plain
   D) Continental slope

3. **In which ocean zone does the floor drop in a steep slope?**

   A) Continental shelf
   B) Hadal zone
   C) Abyssal plain
   D) Continental slope

4. **What area of the oceans is a large flat area that goes on for miles?**

   A) Continental shelf
   B) Hadal zone
   C) Abyssal plain
   D) Continental slope

5. **Which ocean zone has deep, v-shaped trenches?**

   A) Continental shelf
   B) Hadal zone
   C) Abyssal plain
   D) Continental slope

6. **The ocean floor has some of the same landforms as on land, such as mountains and plateaus.**

   A) True
   B) False

7. **Where tectonic plates are moving apart, _____ valleys are formed.**

   A) oceanic
   B) rock
   C) water
   D) rift

8. **What landform is unique to oceans and spews out super hot water?**

   A) Ocean geysers
   B) Hydrothermal vents
   C) Sea spouts
   D) Oceanic vents

9. **No life is able to survive near the landforms that spew super hot water.**

   A) True
   B) False

Answer Key

LESSON 1

1. A) Sphere
2. B) False
3. A) Gravity
4. C) The distance from a star where liquid water can exist on a planet
5. D) Solar system
6. A) True
7. B) Liquid water

LESSON 2

1. B) Hydrosphere
2. D) Atmosphere
3. B) False
4. A) Geosphere
5. C) Biosphere
6. D) Oceans
7. C) Gases
8. B) Life
9. B) Under our feet

LESSON 3

1. D) Longitude lines
2. C) Latitude lines
3. A) True
4. C) North, south, east, west
5. B) False
6. A) The equator
7. D) The prime meridian

LESSON 4

1. C) A day
2. A) True
3. A) Hours
4. B) False
5. C) Moon phases
6. D) 24
7. C) 7
8. A) 12

LESSON 5

1. B) Summer
2. A) True
3. D) Solstices
4. B) Equinoxes
5. B) False
6. A) The terminator
7. D) Arctic and Antarctic Circles
8. C) Temperate Zone
9. A) The tilt of the Earth's axis

LESSON 6

1. B) False
2. D) Colder
3. C) 5
4. A) Tropical
5. B) Less
6. D) Temperate
7. C) Subpolar
8. B) Polar
9. A) True

LESSON 7

1. C) Gases
2. B) False
3. D) Troposphere
4. C) Stratosphere
5. A) Ozone layer
6. A) Mesosphere
7. B) Thermosphere
8. D) Auroras
9. C) Helps to form rocks in the geosphere

LESSON 8

1. D) Midnight
2. B) False
3. C) Salt water
4. A) Fresh water
5. D) Groundwater
6. A) True
7. C) Vapor
8. D) Glaciers

LESSON 9

1. B) 5
2. C) Pacific
3. B) Wind
4. D) Gravity
5. D) Currents
6. D) Clockwise
7. A) True
8. C) Tides

LESSON 10

1. D) Salt water is much saltier.
2. B) False
3. A) Lentic
4. A) True
5. C) Lotic
6. B) Digging a well
7. D) A spring
8. C) Glaciers
9. A) Australia
10. B) Icebergs

LESSON 11

1. B) Drought
2. A) H_2O
3. C) Liquid; solid
4. A) Melting
5. A) True
6. D) Condensation
7. B) Precipitation
8. C) Evaporation, condensation, and precipitation

LESSON 12

1. B) False
2. A) Troposphere
3. C) Water vapor
4. C) Alto
5. B) Nimbo
6. C) Precipitation
7. A) True

LESSON 13

1. B) False
2. A) Meteorologist
3. B) Wind
4. A) Cloudy, cooler, and damp
5. C) Warm, dry, and sunny
6. D) Mostly cloudy
7. A) True
8. D) Precipitation

LESSON 14

1. A) Front
2. B) False
3. A) Nimbostratus
4. D) Snow
5. C) Freezing rain
6. B) Sleet
7. A) Hail
8. D) Lightning

LESSON 15

1. B) Tornado
2. D) Fujita
3. B) False
4. A) It touches the ground
5. C) Updraft
6. A) True
7. B) Tornado Alley
8. B) About ten minutes

LESSON 16

1. B) Seventy-four miles per hour
2. A) Saffir-Simpson
3. D) Hurricane hunters
4. B) Evaporation
5. A) True
6. D) Tropic and Subtropic
7. B) False
8. A) Warm water
9. C) Cyclones

LESSON 17

1. C) Crust, mantle, core
2. D) Crust
3. B) False
4. A) Mantle
5. B) Hot
6. D) Two
7. B) Rock
8. A) Metal
9. B) Rock
10. D) Magnetosphere

LESSON 18

1. C) Minerals
2. B) False
3. A) Steel
4. A) True
5. C) Geologist
6. C) Size
7. D) Streak
8. C) Mohs
9. B) False

LESSON 19

1. B) False
2. B) Lava
3. A) Igneous
4. A) True
5. B) Sediment
6. B) Sedimentary
7. D) Metamorphic
8. B) False

LESSON 20

1. B) False
2. C) Deep in the earth
3. A) Tectonic plates
4. D) Continental plates
5. A) True
6. B) Boundaries
7. A) Continents are being pushed apart
8. D) The theory of plate tectonics
9. A) True

LESSON 21

1. B) Plates push into each other
2. B) False
3. C) Mountains
4. A) Trenches
5. B) Volcanoes
6. D) Divergent
7. C) Transform
8. C) Transform

LESSON 22

1. B) Volcano
2. A) Convergent and divergent
3. B) False
4. C) Lava
5. D) Deep in the ocean
6. B) Islands
7. A) Ring of fire
8. B) False
9. C) The land near the volcano becomes good for growing crops

LESSON 23

1. A) Tectonic plates shifting
2. C) Transform
3. B) False
4. B) Seismology
5. D) Convergent
6. A) The Ring of Fire
7. A) True
8. C) Epicenter
9. B) Richter scale

LESSON 24

1. B) False
2. C) Earthquakes
3. B) Up to miles inland from the ocean
4. A) True
5. D) Up to five hundred miles per hour
6. A) On the seafloor

LESSON 25

1. B) Weathering
2. A) Physical
3. C) Chemical
4. B) False
5. A) Erosion
6. D) Wind and water
7. A) True

LESSON 26

1. D) All of the above
2. A) Minerals
3. B) Organic matter
4. C) Pores
5. A) True
6. A) The bottom of a mountain
7. C) Air; water
8. B) Plants grow in soil
9. B) Organic

LESSON 27

1. D) Fossils
2. B) False
3. B) Sedimentary
4. A) Trace fossils
5. D) Impressions
6. C) Petrified remains
7. D) Impressions
8. B) Preserved remains
9. A) Trace fossils

LESSON 28

1. B) Ocean
2. B) Topography
3. B) False
4. A) Mountains
5. D) Hills
6. B) Plateaus
7. C) Plains

LESSON 29

1. C) Cave
2. B) False
3. A) Volcanic cave
4. B) Sea cave
5. D) Solution cave
6. C) Limestone
7. A) True
8. A) Stalactites
9. C) Stalagmites
10. A) Columns

LESSON 30

1. C) Ocean floor
2. A) Continental shelf
3. D) Continental slope
4. C) Abyssal plain
5. B) Hadal zone
6. A) True
7. D) Rift
8. B) Hydrothermal vents
9. B) False

EARTH SCIENCE EXPLORED elementary

The heavens are Yours, the earth also is Yours; The world and all it contains, You have founded them.

—Psalm89:11

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This most beautiful system of the sun, planets and comets, could only proceed from the counsel and dominion of an intelligent and powerful being.

—Isaac Newton

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