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LESSON 2

Before We Read

MY LEARNING GOALS

I can

- ○ draw conclusions.
- ○ tell what I know about the ocean.

Life at the Bottom of the Sea

The ocean teems with life from mollusks to crustaceans as well as other organisms. The bottom of the sea also has diverse landforms from fissures and geysers to canyons and deep trenches. Scientists are still learning about the depths of the ocean. In 1951, a research ship was charting the ocean floor near the Mariana Islands in the Pacific Ocean. The scientists were using echo sounders. These instruments bounce sound waves off the ocean floor to gauge how deep the water is. The instruments were showing depths of between two and three miles. Suddenly, they showed a reading of almost seven miles. Even the Grand Canyon is only one mile deep! The scientists named this underwater canyon the Mariana Trench. The Mariana Trench is the deepest part of the ocean ever measured. It stretches deeper below sea level than the height of Mount Everest is above sea level. The Mariana Trench is one of several narrow, deep, and dark trenches in the middle of the Pacific Ocean. Today, scientists still know more about space than they do about the depths of the ocean.

Drawing Conclusions

Sometimes as you read a text, you discover that the author does not state information directly. You must use details from the text to draw conclusions.

Read the paragraph on page 20. Write what you can conclude about the Mariana Trench in the chart.

Details	Conclude
In 1951, a research ship was charting the ocean floor near the Mariana Islands in the Pacific Ocean.	
The instruments were showing depths of between two and three miles.	
Suddenly, they showed a reading of almost seven miles.	

READING

Let's Read

MY LEARNING GOALS

I can

- ○ read and understand an informational text.
- ○ draw conclusions from what I have read.

Hydrothermal Vents

In 1977, scientists made a stunning discovery on the bottom of the Pacific Ocean. The scientists were using the deep-sea submergence vehicle *Alvin* to dive on the mid-ocean ridge. The mid-ocean ridge is an underwater mountain range that circles the globe. Here Earth's tectonic plates are spreading apart. The scientists' mission was to accomplish the first direct observation of this seafloor spreading. On the bottom of the Pacific Ocean, the scientists discovered hydrothermal vents spewing hot, mineral-rich fluids. A hydrothermal vent is like a geyser on the seafloor of the ocean.

Most hydrothermal vents are found at an average depth of seven thousand feet in areas of seafloor spreading along the mid-ocean ridge system. Seawater seeps through fissures in the ocean crust. The cold seawater is heated by hot magma and then comes back to the surface to form vents. The hot seawater in the vents does not boil. This is because of the extreme pressures at the depths where the vents form.

Underline the word that means "cracks."

What discovery did the scientists make?

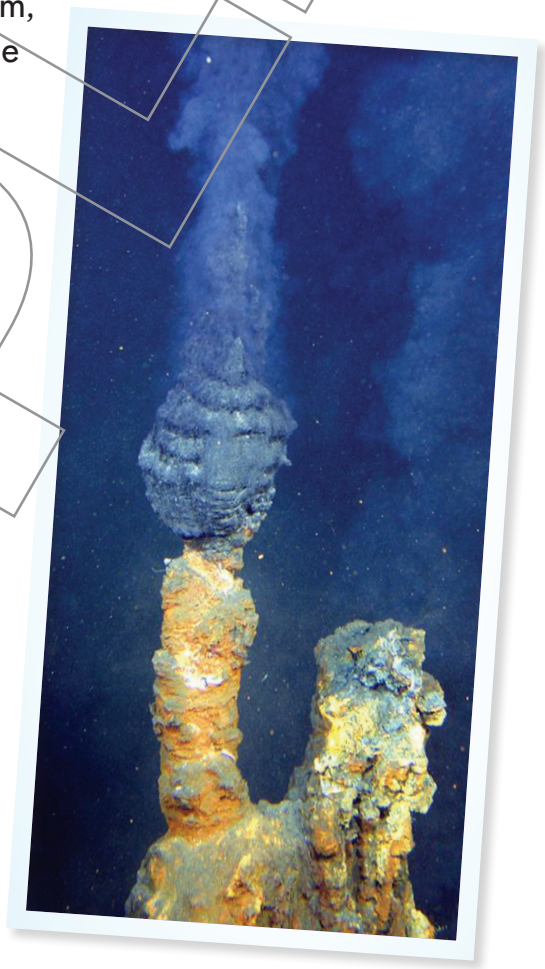
They _____.

Smokers

The hottest hydrothermal vents are called black smokers. Black smokers spew mostly iron and sulfide minerals. These combine to form iron monosulfide. This compound is what gives the smoker its black hue. Black smokers are found mostly in the Pacific Ocean.

White smokers are formed from deposits of barium, calcium, and silicon. White smokers are located in the Atlantic Ocean.

Smokers emit jets of particle-laden fluids. Fine minerals are formed when hot fluids mix with the near-freezing seawaters. Minerals solidify as they cool and create chimneylike structures. The chimneys of these vents grow rapidly. They can grow up to 30 feet in a year and a half. One vent chimney in the Pacific Ocean off the coast of Oregon was named Godzilla because of its size. Before it toppled, the chimney reached the height of a 15-story building. Scientists study these hydrothermal vents because they believe the vents play an important role in the ocean's circulation patterns, chemistry, and temperature. The vents occur more commonly in areas where there is high volcanic activity. Hydrothermal vents may last for years or they may last for less time. The shifting of the tectonic plates and the movement of rocks deep within the oceanic lithosphere may close off vents and open others.



Highlight where the black smokers are found.

What is the difference between a white smoker and a black smoker?

A black smoker _____.

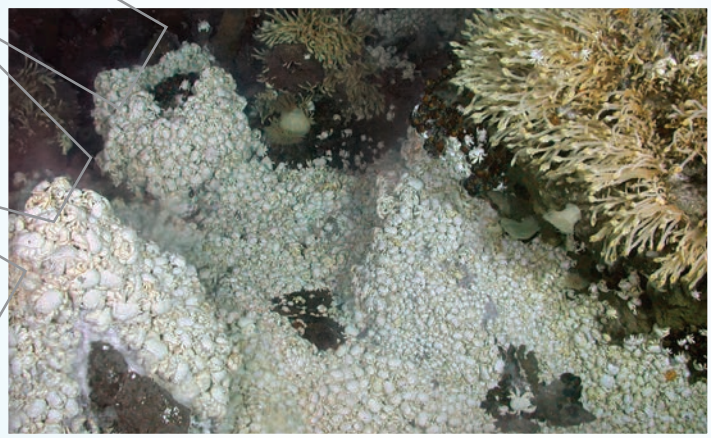
Let's Read

A Harsh Environment

The sea environment near hydrothermal vents is one environment that is harsher than the tundra or desert. Volcanic lava bubbles up through the seafloor. Temperatures range from 750°F near the vents to 36°F in the surrounding sea. No sunlight penetrates this area deeply, so photosynthesis cannot take place. Here, at the bottom of the ocean, the water above exerts enormous pressure.

Hydrothermal vents on the ocean floor would seem to be the most unlikely places to find life on Earth. The vents spew chemicals from inside the earth that would kill most life. The vents also release heavy metals and make the water highly acidic. Yet, scientists were surprised to discover that diverse animal life survives around these vents.

This harsh terrain is the only place in the world where life survives without the sun's help. Plants cannot survive because they get their energy from the sun. Instead, life depends on hydrogen sulfide, a poisonous chemical that releases energy when it reacts with the oxygen in the water. Tiny microbes process that energy, releasing organic compounds. Other animals live off the microbes themselves or the compounds that they release, creating a unique food chain.



Vent crabs on a hydrothermal vent

Circle what sea life depends upon to survive instead of sunlight.

Why were scientists surprised to find life around the hydrothermal vents?

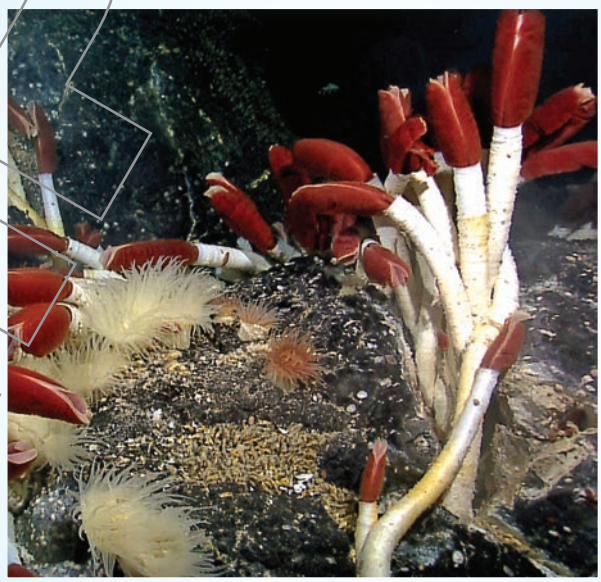
They were surprised because _____.

An Unusual Ecosystem

Mollusks and crustaceans can be found in this environment. The first creatures to colonize around the vents were Bathymodiolus deep-sea mussels. Other creatures include tube worms, which can grow to their full size of almost five feet in less than two years. Vent crabs are at the top of the hierarchy around the vent ecosystem.

The animals down here have adapted in other strange ways, too. Because the ocean above places more than 3,000 pounds of pressure per square inch on them, their bodies have no air pockets such as lungs. They have also evolved to survive extreme temperatures, from the normal water temperature of 36°F to vent fluids that can be 750°F. The acidic water also makes life hard, resulting in snails that do not grow shells, for example. To combat the lack of light near the ocean floor, many species have developed their own sources of light. A large squid has small dots called photophores all over its body that act like tiny lights. A type of fish called the anglerfish has a long piece of flesh that hangs over its face and lights up. This piece of flesh looks like a fisherman's lure and acts in much the same way.

The creatures living here have found ways to deal with the extreme challenges on the ocean floor.



Tube worms

Underline the word that means "fishing hook."

How have sea animals adapted to live near the hydrothermal vents?

One way sea animals have adapted is _____.

Show What You Know

Write what you can conclude about the ocean in the chart.

Details	Conclude
The sea environment near hydrothermal vents is harsher than the tundra or desert.	
These are areas where volcanic lava bubbles up through the sea floor.	
Temperatures range from 750°F near the vents to 36°F in the surrounding sea.	
There is little light that penetrates to these depths.	

What Did You Learn?

Think about what you learned from the passage. Then circle the letter of the correct answer.

1. Which detail supports the idea that hydrothermal vents are an unlikely place to find life?
   - **A** Life depends on hydrogen sulfide.
   - **B** Other animals live off the microbes themselves.
   - **C** The vents release heavy metals and make water highly acidic.
   - **D** Plants cannot survive because they get their energy from the sun.

2. Paragraph two on page 25 is *mainly* about _____.
   - **A** why most life needs sunlight to survive
   - **B** how hydrogen sulfide is converted into energy
   - **C** the many obstacles to surviving around hydrothermal vents
   - **D** how life around hydrothermal vents survives without sunlight

3. This passage is about _____.
   - **A** how life is able to survive without sunlight
   - **B** why hydrothermal vents are a surprising place to find life
   - **C** how life has evolved and survived around hydrothermal vents
   - **D** why most life would not survive in the area around a thermal vent

4. Which word on page 25 means "a system that organizes or ranks things according to importance"?
   - **A** hierarchy
   - **B** ecosystem
   - **C** species
   - **D** challenges

LISTENING

Listen and Discuss

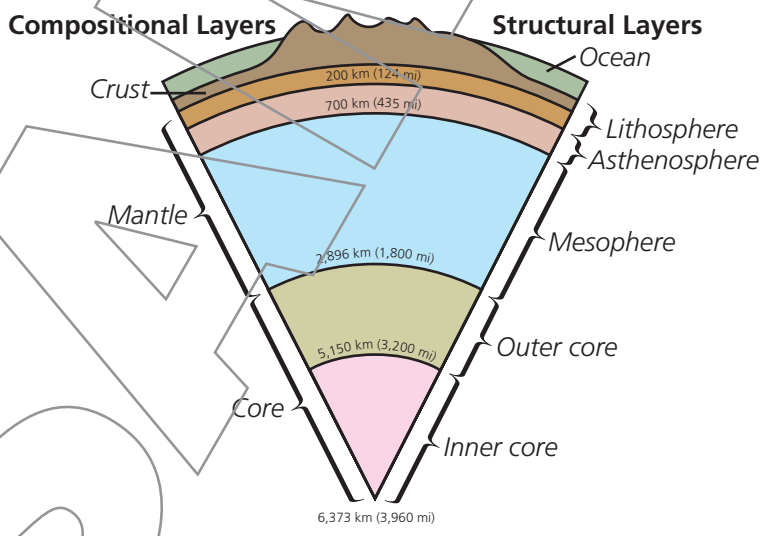
MY LEARNING GOALS

I can

- ○ listen to a conversation about seafloor spreading.
- ○ use information from the conversation to participate in a discussion.

Listen to a conversation between friends about seafloor spreading. While you listen the second time, take notes on the chart below.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

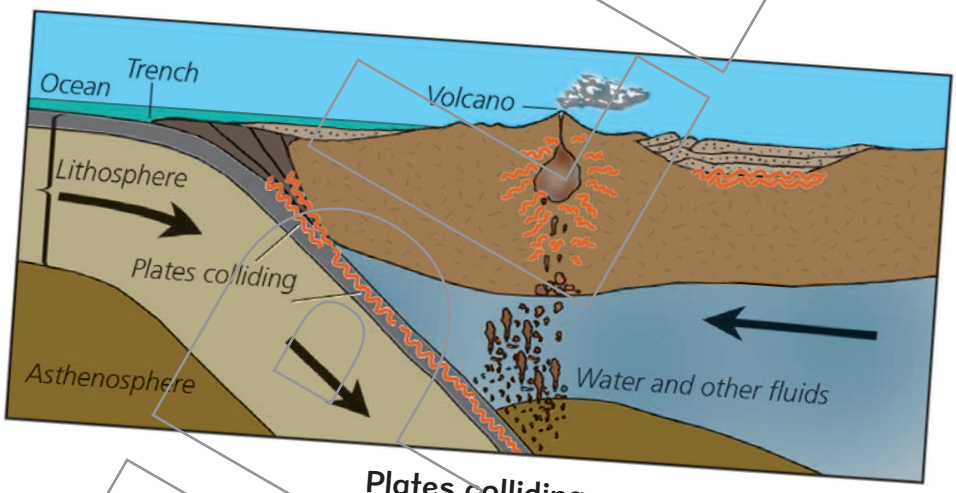


Scientists define both compositional and structural layers in Earth's interior.

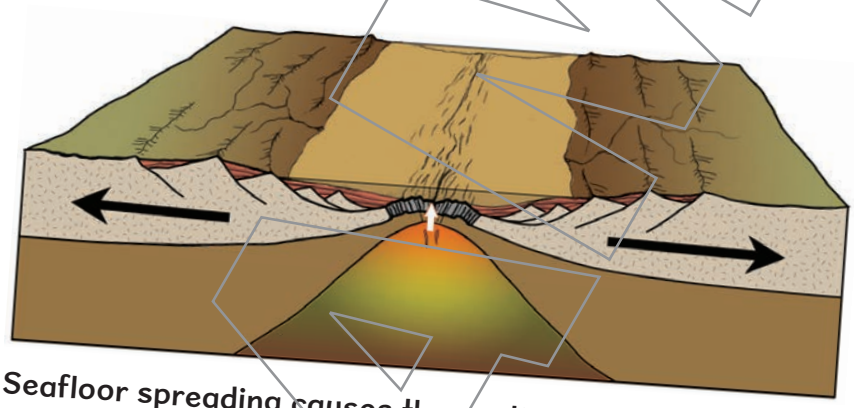
Listen and Discuss

SPEAKING

What have you learned about the ocean floor?



Plates colliding.



Seafloor spreading causes the continents to move farther apart as more crust is added to the ocean floor.

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MY LEARNING GOALS

I can

- ○ identify the subject and verb in a sentence.
- ○ determine if the subject and verb agree.

Subject and Verb Agreement

A subject and verb must agree in any sentence. A singular subject is joined with a singular verb. A subject that names more than one is joined with a plural verb.

Make the verb agree with its subject, not with the word in between.

Tiny microbes process that energy, releasing organic compounds.
plural subject plural verb

Seawater seeps through fissures in the ocean crust.
singular subject singular verb

Read these sentences from the passage. Then underline the subject and circle the verb.

1. Here, at the bottom of the ocean, the water above exerts enormous pressure.

2. Instead, life depends on hydrogen sulfide, a poisonous chemical that releases energy when it reacts with the oxygen in the water.

3. Many species have developed their own sources of light.

4. In the space where the plates move apart, melted rock erupts, cools, and hardens to form a new lithosphere.

5. Vent crabs are at the top of the hierarchy in the ecosystem that has colonized around the vents.

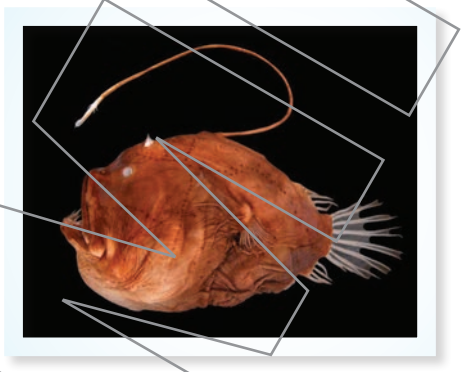
Underline the subject. Then circle the correct verb.

1. The sea environment near hydrothermal vents [is are] harsher than the tundra or desert.

2. Tube worms [grows grow] to almost five feet.

3. The melted rock, or magma, [rises rise] to the surface and erupts, forming a chain of volcanoes.

4. A type of fish called the anglerfish [has have] a long piece of flesh that sticks over its face and lights up.



Write a sentence using a singular subject and verb.

1. _____
_____

Write a sentence using a plural subject and verb.

2. _____
_____

WRITING

Write About It

MY LEARNING GOALS

I can

- ○ write a summary of what I know about hydrothermal vents.
- ○ make my writing better with help from my teacher and classmates.

Everything you read has a central idea that answers the basic question "What is the passage about?" A **summary** identifies the important ideas and details. A summary should be concise and coherent.

Think about what you learned about hydrothermal vents and seafloor spreading. Write a paragraph that summarizes what you learned.

Plan My Writing

Fill in the chart to help you write your summary.

Introduction
Important Fact
Important Fact
Closing

Write About It

WRITING

What are hydrothermal vents? Hydrothermal vents are like _____

_____.

These hydrothermal vents spew _____

_____.