chapter 6

Volcanoes

section 1 Volcanoes and Earth's Moving Plates

Before You Read

Think about what happens to a wax candle after you light it. On the lines below, describe what happens to the wax and what it does. Then describe what happens to the wax after the flame is blown out.

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What You'll Learn

- how volcanoes affect people
- what causes volcanoes
- the relationship between volcanoes and Earth's plates

Read to Learn

What are volcanoes?

A **volcano** is an opening in Earth's surface that erupts gases, ash, and lava. These materials pile up in layers around the opening, forming volcanic mountains. Today, Earth has more than 600 active volcanoes. An active volcano is one that has erupted within recorded history.

Which volcanoes erupt most often?

The most active volcano on Earth is in Hawaii. It is called Kilauea (kee low AY ah). This volcano has been erupting for hundreds of years, but its eruptions are slow, not explosive. Since 1983, Kilauea has had a series of eruptions that continue today. In May of 1990, it destroyed most of the town of Kalapana Gardens. Because its lava flowed slowly, people had time to escape and no one was hurt.

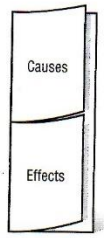
The country of Iceland is also famous for its active volcanoes. This island country is located in an area where Earth's plates move apart. Because of its northern location and active volcanoes, it is known as the land of fire and ice.

Mark the Text

Highlight Identify the key terms and their meanings as you read this section.

FOLDABLES™

A Cause and Effect Make a two-tab Foldable as shown. As you read, take notes on the causes and effects of volcanoes.



Effects of Eruptions

Volcanic eruptions have a serious impact on people who live nearby. Their lives may be in danger. Even if people are able to evacuate or escape, their property is often damaged or destroyed. The lava flowing from a volcano destroys everything in its path. Volcanic ash and dust falling from the sky can collapse buildings and block roads. Ash can cause lung diseases in people and animals.

What is a pyroclastic flow?

Sometimes volcanic ash and other matter rush down the side of a volcano. This is called a pyroclastic (pi roh CLAS tihk) flow. Temperatures inside a pyroclastic flow can be hot enough to catch wood on fire. If the flow is heavy, people in nearby towns are forced to abandon their homes. Buildings, roads and crops may be destroyed by the pyroclastic flow.

Think it Over

1. **Explain** two effects of volcanic eruptions.

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How do volcanoes affect humans and the environment?

The Soufrière (sew FREE er) Hills volcano on the island of Montserrat erupted in July of 1995. Geologists knew it was about to erupt. They warned people living nearby to evacuate. Two years after the eruption began, large pyroclastic flows swept down the sides of the volcano. Cities and towns were buried. Plant life was destroyed. Twenty people who didn't evacuate were killed. This eruption was one of the largest recent volcanic eruptions near North America.

Sulfurous gas is released during volcanic eruptions. When these gases mix with water vapor in the atmosphere, acid rain forms. On the island of Montserrat, the acid rain destroyed the vegetation. Acid rain fell into the lakes and streams and killed fish. As the vegetation died, the animals living in the forests left or died. When a volcano erupts, it is a danger to all living organisms and to the environment.

How do volcanoes form?

Reading Check

2. **Identify** What two factors work together to melt rock into magma?

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What happens inside Earth to create volcanoes? Why do volcanoes occur in some places and not in others? Deep inside Earth, heat and pressure melt rocks. The liquid rock is called magma. Some rocks deep in Earth already are melted. Other rocks are so hot, the smallest rise in temperature or drop in pressure melts them into magma. What makes magma come to the surface? ☑

Why is magma forced upward?

Magma is not as dense as the rock around it. This difference in density forces the magma to rise toward Earth's surface. You can see this process if you turn a bottle of cold syrup upside down. The dense syrup will force the less dense air bubbles to slowly rise.

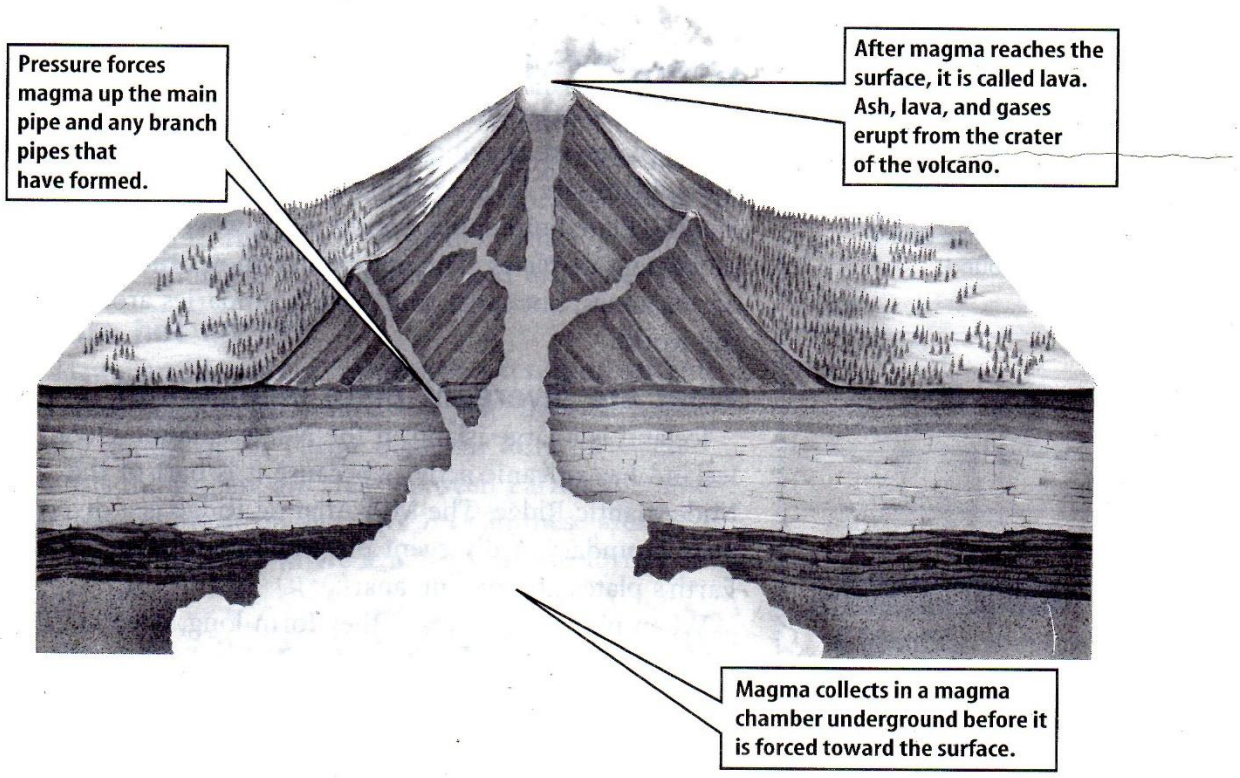
After many thousands or even millions of years, magma reaches Earth's surface. Magma flows out through an opening called a **vent.**

Once magma reaches Earth's surface, it is called lava. As lava flows out, it cools and becomes solid, forming layers of igneous rock around the vent. Often the area around the vent is bowl-shaped. The steep, bowl-shaped area around a volcano's vent is the **crater.** The figure below shows magma inside Earth being forced to the surface.

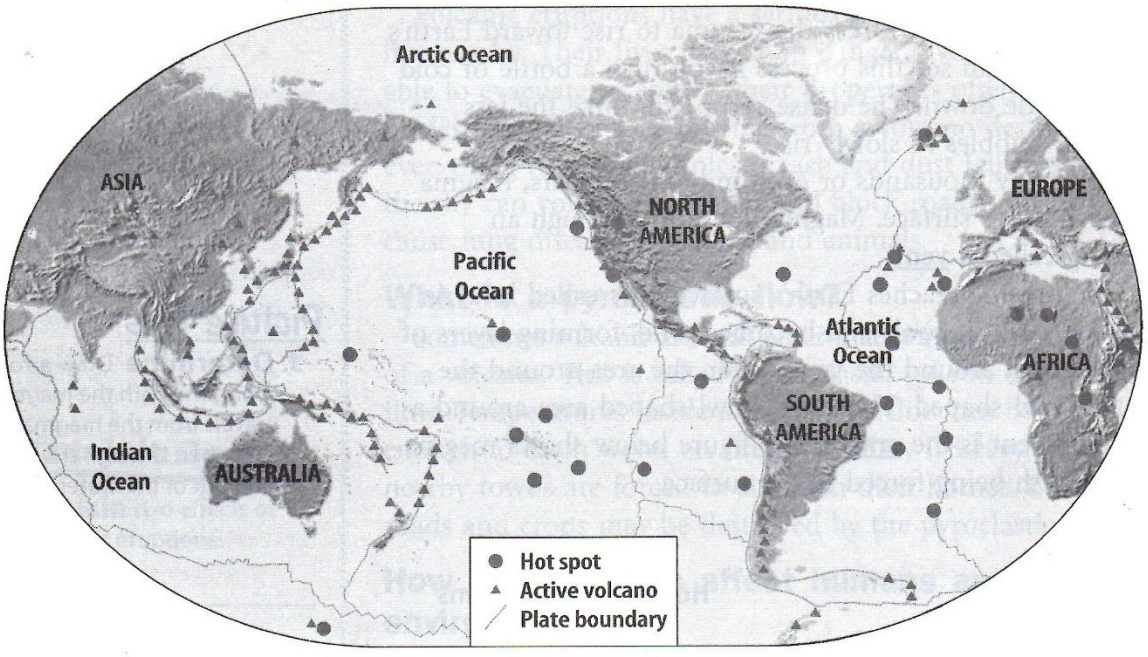
Picture This

3. Determine Draw arrows along the path the magma travels from the magma chamber, through the vent, and out of the crater.

How a Volcano Forms



Volcanoes, Hot Spots, and Plate Boundaries



Picture This

4. **Analyze** Highlight plate boundaries on the map. Notice the volcanoes along the way. Now look for hot spots. Describe where they are found.

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Where do volcanoes occur?

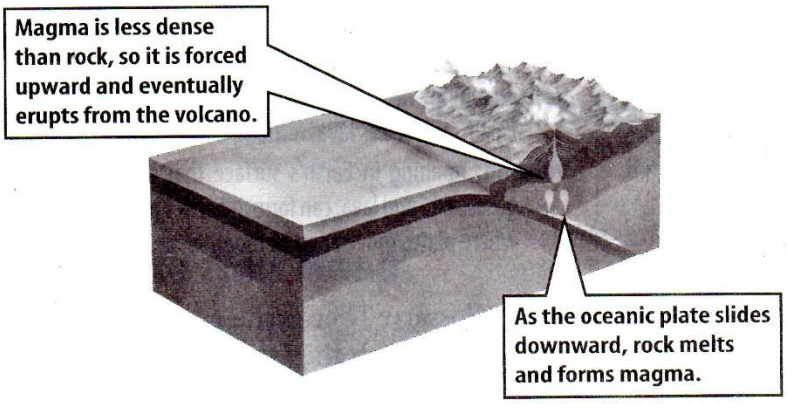
Volcanoes often form where plates are moving apart, where plates are moving together, and in areas called hot spots. Plates are large sections of Earth's crust and upper mantle. Plate boundaries are the areas where there is movement of plates. The map above shows the locations of volcanoes, hot spots, and plate boundaries around the world.

What are divergent plate boundaries?

Iceland is a large island in the North Atlantic Ocean. Iceland has volcanic activity because it is part of the Mid-Atlantic Ridge. The Mid-Atlantic Ridge is a divergent plate boundary. A divergent plate boundary is an area where Earth's plates are moving apart.

When plates move apart, they form long, deep cracks called rifts. Lava flows from these rifts and is cooled quickly by the seawater. As more lava flows and hardens, it builds up on the seafloor. Sometimes, the volcanos and rift eruptions rise above sea level. Islands such as Iceland formed in this way. In 1963, another island, Surtsey, formed nearby.

Convergent Plate Boundaries



What occurs at convergent plate boundaries?

Areas where Earth's plates are pushing together are convergent plate boundaries. Sometimes an oceanic plate slides under a continental plate. Other times, an oceanic plate slides under another oceanic plate. The figure above shows how volcanoes can form where plates collide and one plate slides below the other. The Andes mountain range in South America began forming when an oceanic plate started sliding under a continental plate. Volcanoes that form on convergent plate boundaries usually have more explosive eruptions than other volcanoes. Magma forms when the plate sliding below another plate gets deep enough and hot enough to melt partially. The magma is forced to rise slowly to Earth's surface, forming volcanoes like Soufrière Hills on the island of Montserrat.

What are hot spots?

The Hawaiian Islands are forming as a result of volcanic activity. But they haven't formed at a plate boundary. They are in the middle of the Pacific Plate, far from its edges.

Scientists think there are areas between Earth's core and mantle that are unusually hot. Hot rock in these areas is forced toward the crust where it partly melts to form a **hot spot**. ☑

How were the Hawaiian Islands formed?

The Hawaiian Islands sit on top of a hot spot under the Pacific Plate. Magma has broken through the crust to form several volcanoes. The volcanoes that rise above the ocean form the Hawaiian Islands.

Picture This

5. **Interpret** Circle the plate that is going underneath the other plate.

Reading Check

6. **Identify** What is an unusually hot area between Earth's mantle and core called?

_____

After You Read

Mini Glossary

crater: steep, bowl-shaped area around a volcano's vent

hot spot: unusually hot area between Earth's mantle and core that forms volcanoes when melted rock is forced upward and breaks through the crust

vent: opening where magma is forced up and flows out onto Earth's surface as lava, forming a volcano

volcano: opening in Earth's surface that erupts sulfurous gases, ash, and lava; can form at Earth's plate boundaries, where plates move apart or together, and at hot spots

1. Review the terms and their definitions in the Mini Glossary. Then write a sentence that describes the materials that erupt from a volcano and the path they take.

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_____

2. Write the following events in the order in which they occur.

Magma slowly rises to Earth's surface.
Lava hardens to rock.
Heat and pressure deep inside Earth cause rock to melt.
Magma erupts through a vent.

First

Second

Third

Fourth

End of Section

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