

VOLCANOES

The intense heat and pressures in the mantle turn solid rock into liquid **magma**. Magma comes out through the surface of the crust to form volcanoes. The type of volcano formed and the style of eruption depends on the silica content, and therefore, the **viscosity** of the magma.

The “Ring of Fire” is a series of volcanoes that indicates tectonic plate boundaries and contains about 75% of the world’s active volcanoes. The “Ring of Fire” marks the boundary of the Pacific Ocean basin.

Volcanoes and Plate Boundaries

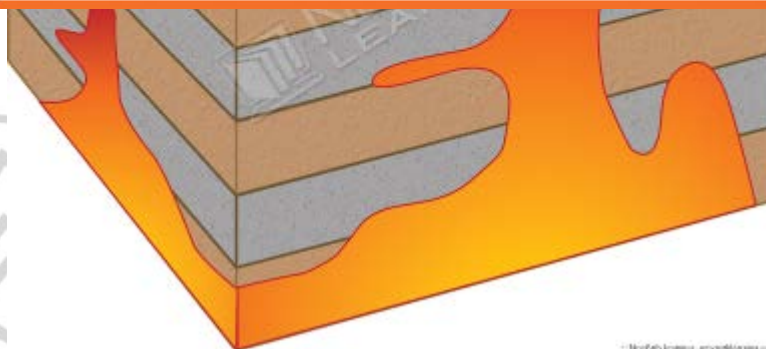
There are two distinct types of volcanic eruptions.



PREVIEW

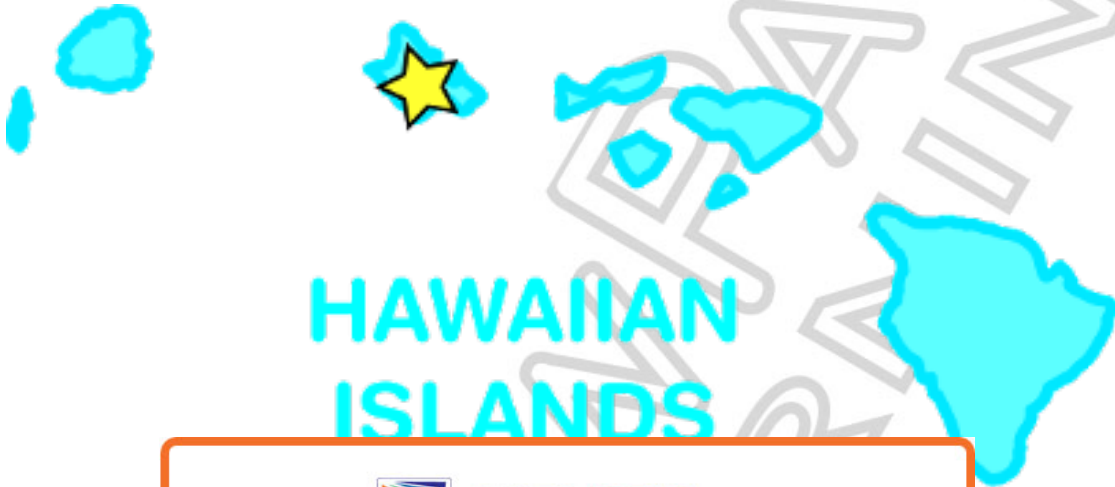
Please login or register to download the printable version of this study guide.

www.newpathlearning.com



Explosive eruptions occur when highly viscous magma (that is, magma with a very high silica content) erupts through continental crust. Explosive eruptions are truly explosive and extremely destructive. They throw hot ash, particles and chunks of rock, and gases into the air. Ash from explosive eruptions can travel into the stratosphere and encircle the entire Earth for many years. This ash layer can lower global temperatures. Explosive eruptions are typical of tectonic plate boundaries where an oceanic plate is subducted under a continental plate.

The ash and rock that is extruded by explosive volcanoes is called **pyroclastic material**. A mudflow of mixed water and volcanic ash can travel very, very quickly down a volcano and cause widespread destruction. This volcanic mudflow is called a **lahar**.



Please login or register to download the printable version of this study guide.

www.newpathlearning.com

The second
less viscous
non-explosive
magma.
lava.) No
places where

occur in the middle of oceanic plates at **hot spots**. A hot spot is an extremely thin portion of the oceanic plate that has a magma body very close to the surface. The Hawaiian Islands are non-explosive volcanoes that formed at a hot spot in the Pacific Ocean basin.

Sometimes lava flows out of a long crack in the crust rather than through a hole. When this happens, extremely thick layers of lava can cover thousands of square miles. These thick, extensive layers of lava are called **lava plateaus**.

Lesson Checkpoint:
How did the Hawaiian Islands form?

Volcanic Eruptions and Properties of Magma

The type of a volcanic eruption is determined by the physical properties of the magma extruded by a particular volcano. In short, non-explosive volcanoes extrude lava that has lower viscosity (in other words, it is runnier). By comparison explosive volcanoes extrude pieces of hot rock because the lava has a high viscosity (in other words, it is very, very sticky).



The igneous rock type that flows from non-explosive volcanoes is basalt. Different names are given to the types of lava that pours from a non-explosive volcano. **Pahoehoe** lava is ropy-looking because the outer crust hardens but underneath the liquid lava continues to flow. Here is a picture of pahoehoe lava.

Aa lava is blocky lava that cooled into irregular, sharp-edged chunks. Lava that cools instantly into volcanic glass is called **obsidian**. Small and large t... volcano.
These are



Please login or register to download the printable version of this study guide.

www.newpathlearning.com



Obsidian

When lava pours out of mid-ocean ridges onto the ocean floor, it cools rapidly from contact with the very cold water of the deep ocean. The result is the accumulation of rounded masses of basalt. This is called **pillow basalt**. Pillow basalts found on dry land indicate that that land was, at one time in geologic history, under an ocean and volcanically active.

Lesson Checkpoint:
What is obsidian?

Three Types of Volcanoes

Volcanoes can also be classified based on their shape. The three categories are **cinder cones**, **shield volcanoes** and **stratovolcanoes**.

Cinder cones are relatively small volcanoes formed by the accumulation of pyroclastic material. The sides of cinder cones are steep. Shield volcanoes are wide, flat volcanoes formed by the non-explosive flow of lava onto the surface. The largest shield volcano in our solar system is Olympus Mons on Mars. Stratovolcanoes are the most common type of volcanoes. They are formed by the alternating of layers of pyroclastic material and lava flows. Below are pictures of each type of volcano.



Cinder cone



Mauna Loa, a shield volcano, in Hawaii



Mt. St. Helens, a stratovolcano, erupted in 1980 in Washington State

Lava makes its way from deep in the crust to the surface through a tube called the **vent**. At the top of many volcanic vents is a cone-shaped depression called a crater. From the volcano, lava can flow out of the vent and become part of a lava flow. The chamber, the magma chamber, is called a magma chamber.



Please login or register to download the printable version of this study guide.

www.newpathlearning.com



Lesson Checkpoint:
Name the three categories of volcanoes.

What Causes Hot Springs and Geysers?

In special situations, magma reservoirs occur very near the surface. The intense heat from the magma heats the groundwater. Hot groundwater can come to the surface in a number of interesting and spectacular ways.

Geysers are fountains of hot water that spray out of the ground at regular intervals. The water is heated and when it reaches a certain pressure it shoots out of the ground until the pressure is relieved. Then new water percolates through the rock, is heated and will eventually spray out of the ground. Old Faithful is a famous geyser in Yellowstone National Park.

When the water is not under pressure, it flows out of the ground. This is called a **hot spring**. **Mud pots** form when heated water mixes with sediments and collects in pools. These pools typically bubble like thick stew in a pot.

In some situations, geysers are used as an energy source. Geothermal energy (like solar energy) is piped directly to the surface and used to drive turbines.

ed and
rmal
ected and
times be



Please login or register to download the printable version of this study guide.

www.newpathlearning.com