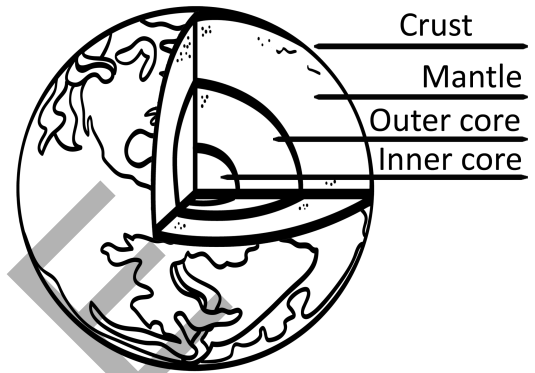


Volcanoes, Earthquakes & Plate Tectonics

You are probably already familiar with the layers of the Earth, but we're going to review them quickly just so we remember. The **crust** is the very top layer of the Earth. It's made of rock and includes the ground we stand on, the ocean floor, and miles and miles of rock and dirt. Scientists think it is about 5 to 25 miles (8 to 40 kilometers) thick.

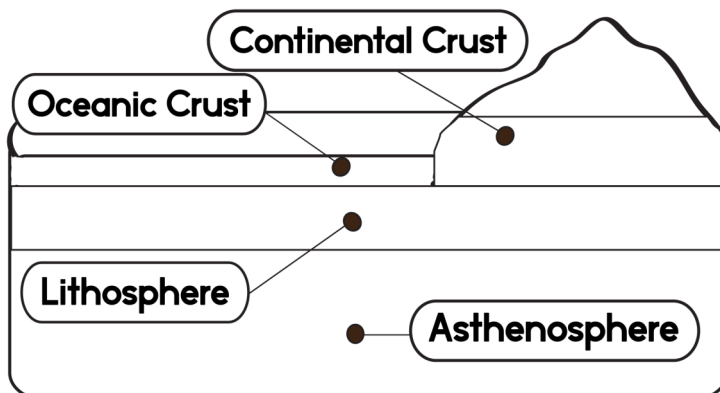
The next layer is the **mantle**. The mantle is made of rock, but it's a little bit different. The very top of the mantle is hard rock, but there is so much heat and pressure on the rock in the rest of the mantle that the rock isn't solid or hard, like we usually think of rock. This rock is sort of sticky and gooey, a little like caramel. It's not totally solid, and it's not totally liquid. It can move and flow from place to place, and scientists think it is about 1,800 miles (2,900 kilometers) thick.



The next layer of the earth is called the **outer core**. This layer is liquid iron, and the earth's mantle rests on top of it. Scientists think this layer is about 1,400 miles (2,250 kilometers) thick.

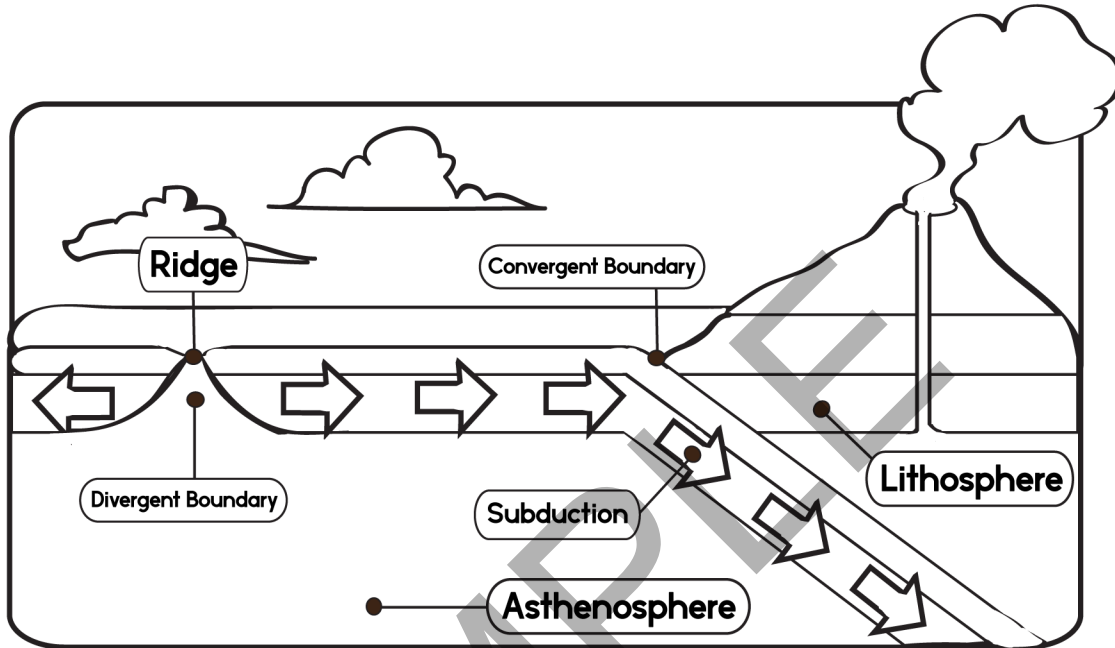
The deepest layer is called the **inner core**. Scientists think this layer is made of nickel and iron that form an extremely hard ball in the middle of the earth.

Scientists have even more categories and ways to separate the different layers near the surface of the Earth that will be helpful as we learn about earthquakes and volcanoes. The crust isn't the same everywhere. We call the part of the crust that the continents are on the **continental crust**. It's very thick, reaching about 30 miles (50 kilometers) beneath the continents. The **oceanic crust** is the ocean floor. It is much thinner and reaches about 3-6 miles (5-10 kilometers) beneath the ocean. The deepest spot in the ocean we've found is called the Mariana Trench. It stretches 35,840 feet (10,924 meters) deep, which is less than 7 miles (11 kilometers).



The crust and the very top part of the mantle together are called the **lithosphere**. The rest of the mantle beneath them is called the **asthenosphere**.

Let's take another look at how these parts work together. In this diagram, you can see a convergent boundary between the ocean and the continent. Subduction is happening where one plate is pushing beneath the other. A divergent boundary in the ocean is causing a ridge to form. The layer of crust and upper mantle where the plates are is the lithosphere, and the gooey mantle beneath is the asthenosphere.



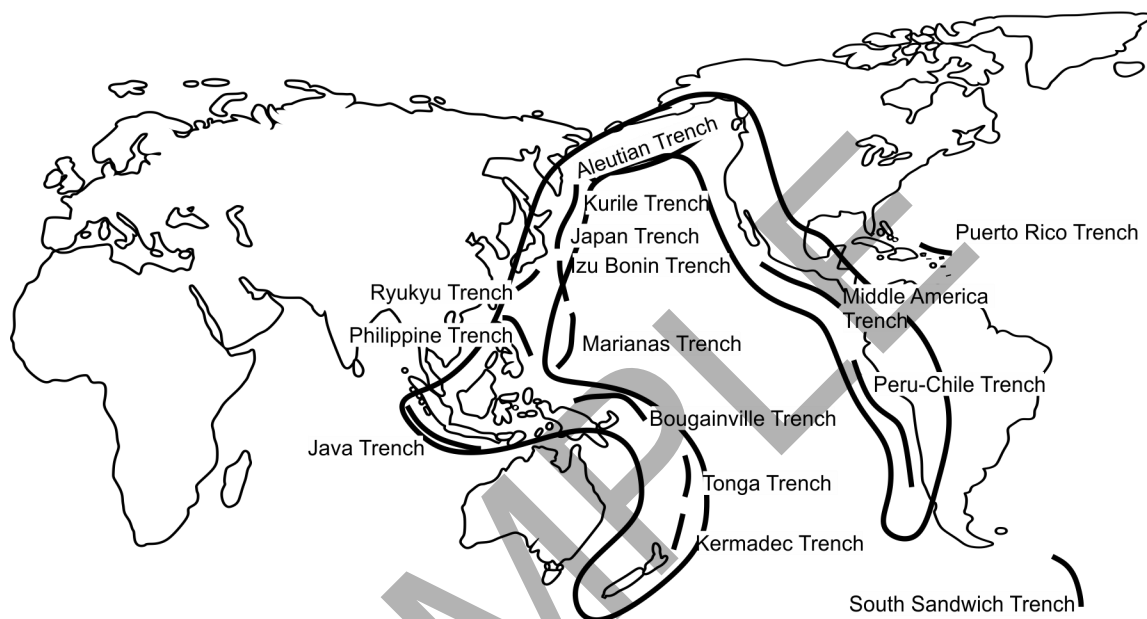
As you might imagine, when tectonic plates move, it can cause a lot of problems for people. After all, typically, the ground shouldn't move a lot under our feet. When it does, it can cause buildings to shake, gas lines to break, power lines to fall, and many other dangerous situations. As the plates interact with each other, we get earthquakes. Most are far too small to be noticed, but some are major catastrophes.



Earthquakes can also cause tsunamis, which are series of powerful ocean waves we'll read about in few minutes. They can even cause something called **liquefaction**. Liquefaction is when the soil acts like a liquid instead of a solid, causing things to sink.

LIQUEFICATION

There have been many major volcanic eruptions throughout history, including the eruption of Mount Vesuvius that buried Pompeii, Italy, in the year AD 79. But many of the worst disasters have happened along the **Ring of Fire**. It's an area in the Pacific Ocean that involves several tectonic plates, including the Pacific Plate, the Philippine Plate, the Cocos Plate, and the Nazca Plate. The deepest spot on Earth, the Marianas Trench, is also found in the Ring of Fire. The Ring of Fire is shaped like a horseshoe that starts in New Zealand and stretches up to the Philippines, Japan, and Alaska, then south to the western United States, Mexico, and the Andes Mountains in South America. It's about 25,000 miles (40,000 kilometers) long.



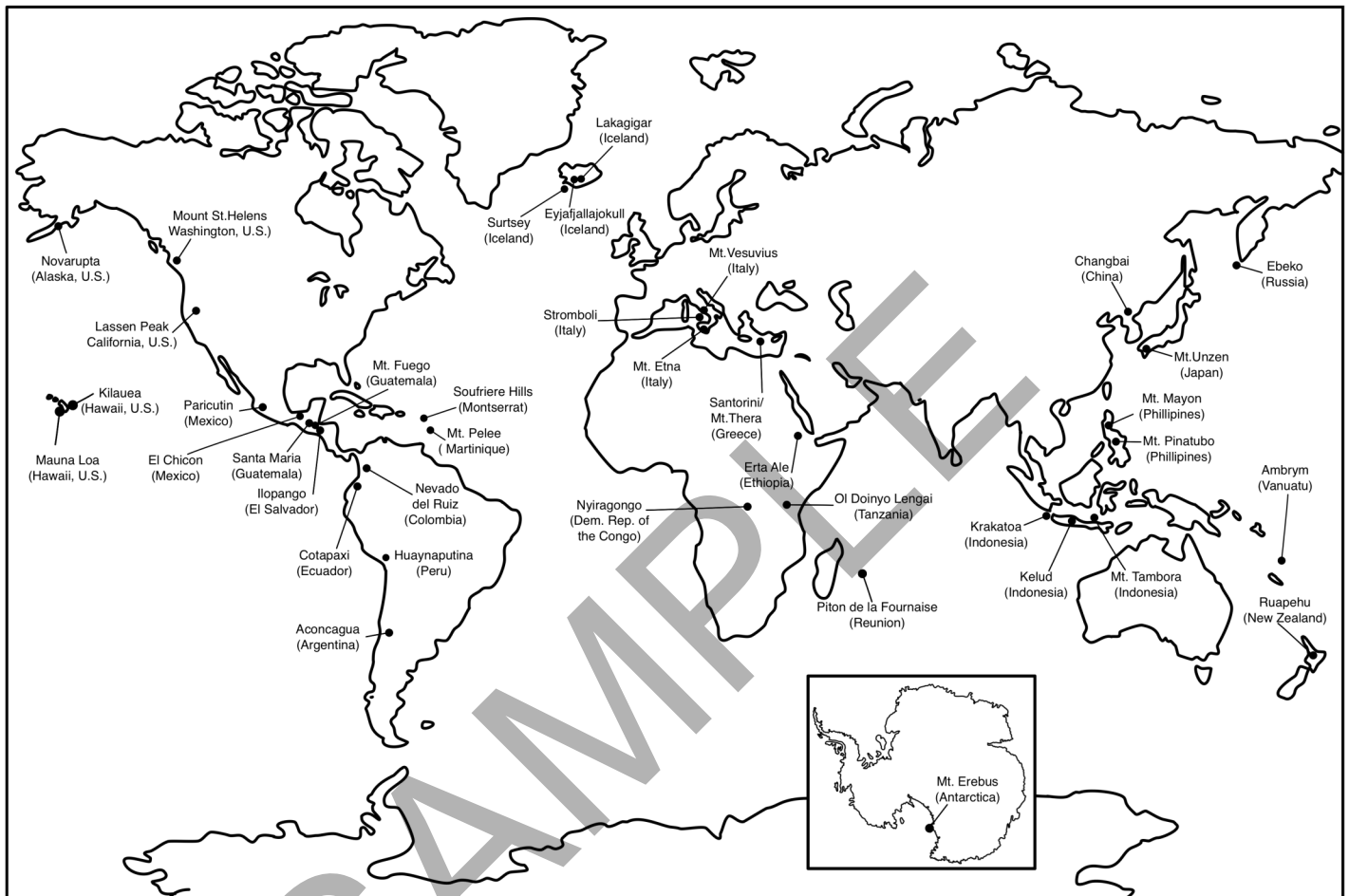
Even though it is a narrow strip, it is home to more than half of the world's active volcanoes, with about 350 along the ring. It is also the home of thousands of earthquakes every year. The most powerful volcanic explosion ever recorded happened at Mount Tambora in Indonesia in 1815. The explosion and the tsunami that followed devastated the area. The volcano was about 14,000 feet (4,300 meters) high before the eruption, but it is only 9,354 feet (2,851 meters) high today following the major eruption and several smaller ones. The caldera the eruption left behind is about 3.7 miles (6 kilometers) across.

Another serious volcanic eruption in Indonesia happened in 1883 when Krakatoa exploded. It created a cloud of ash that reached 50 miles (80 kilometers) high. The explosions were heard in Australia, and the tsunami waves reached to Hawaii and South America. The largest wave, which struck the Indonesian towns of Java and Sumatra soon after the explosion, was 120 feet (37 meters) high.

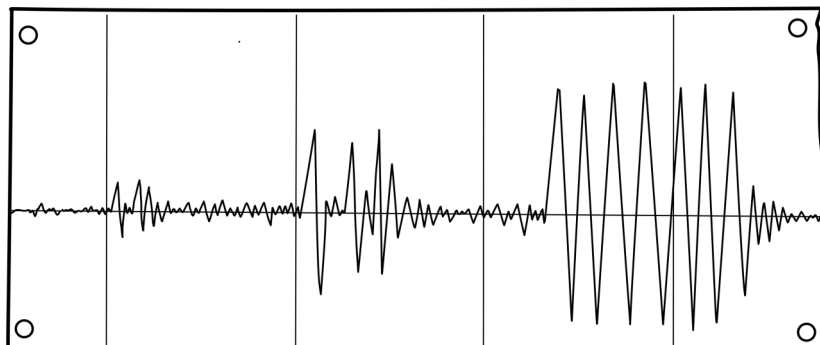
The 1980 eruption of Mount St. Helens was not the strongest volcanic eruption in United States history (that was Novarupta in Alaska in 1912), but it was the most destructive. The volcano blasted more than 1,000 feet (300 meters) of its top into

the air, destroying buildings and roads, flattening trees, covering crops in ash, and killing dozens of people.

Look at the map and see how many of the worst volcanic eruptions in history have happened around the Ring of Fire.



As scientists continue to study earthquakes, tsunamis, and volcanoes, we can hope they will find new ways of predicting when these disasters will happen so many more people can be kept safe. Maybe *you* will be the one to find the answers.



Terminology

Using what you learned, define these words in the best way you can. Use the back of the page if you need more room.

Crust: _____

Mantle: _____

Outer core: _____

Inner core: _____

Continental crust: _____

Oceanic crust: _____

Lithosphere: _____

Asthenosphere: _____

Divergent boundary: _____

Convergent boundary: _____

Transform boundary: _____

Subduction: _____

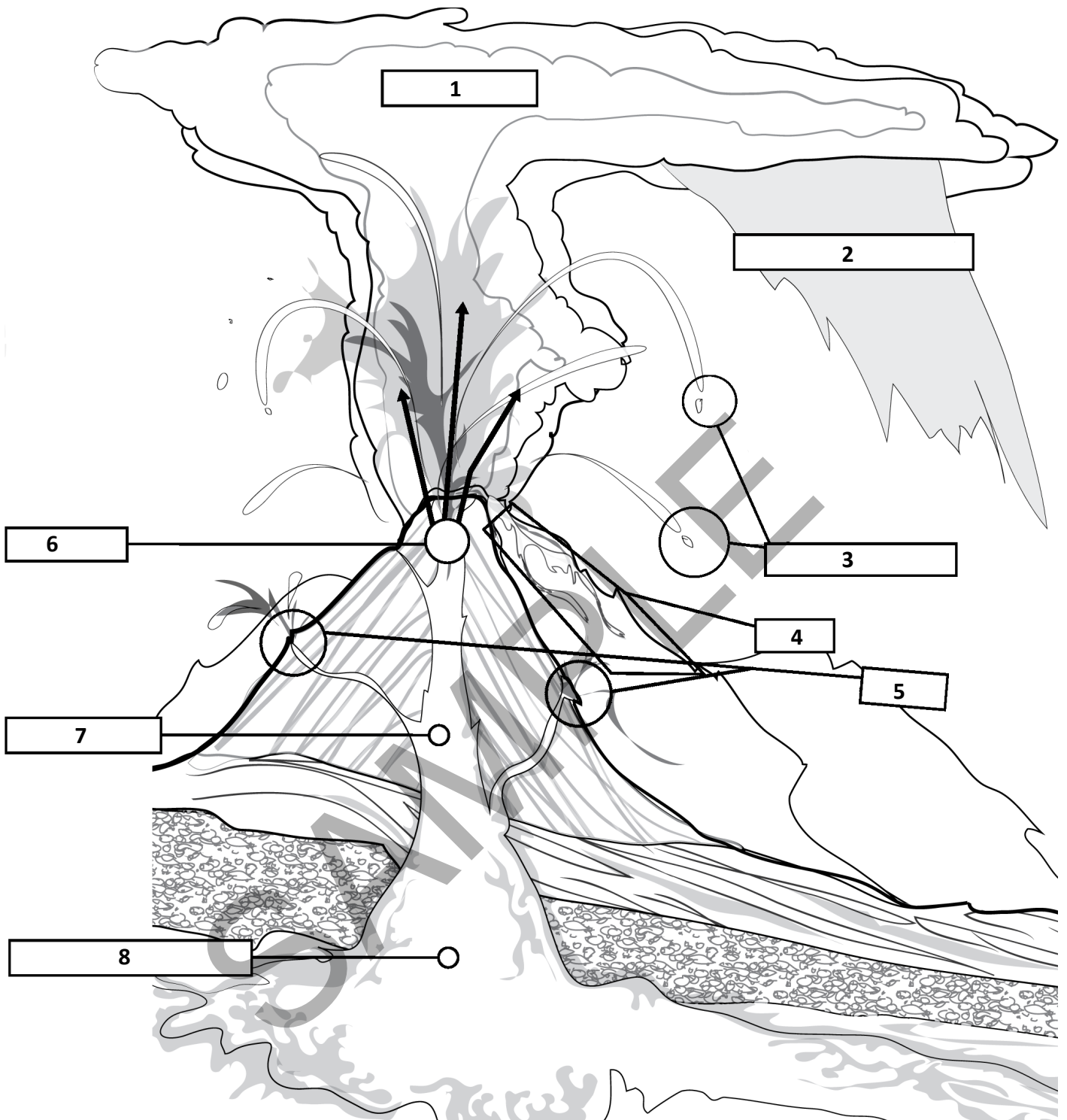
Liquefaction: _____

Fault: _____

Normal fault: _____

Reverse fault: _____

Transform fault: _____



1. _____

5. _____

2. _____

6. _____

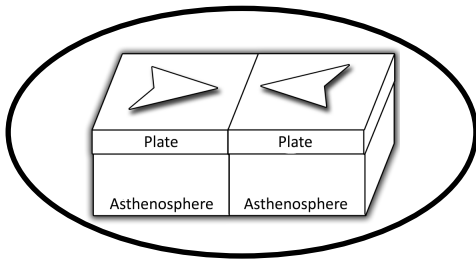
3. _____

7. _____

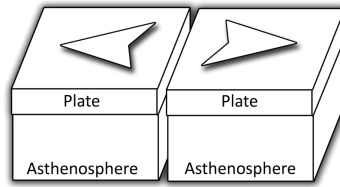
4. _____

8. _____

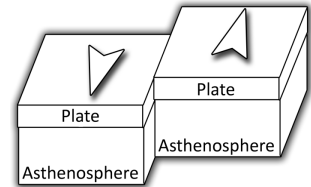
Which of the following shows a convergent boundary? Draw a circle around it.



Boundary

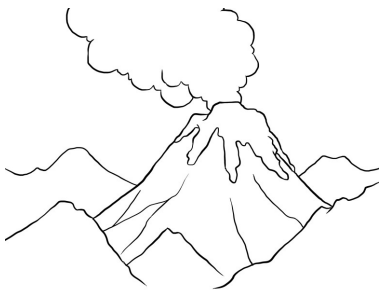


Boundary

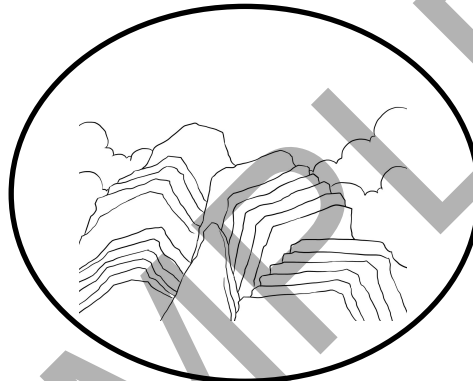


Boundary

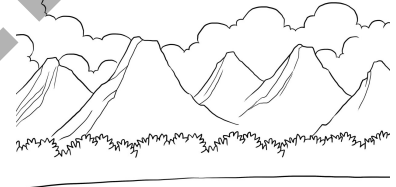
Which of the following show fold-thrust (folded) mountains? Draw a circle around it.



Mountains

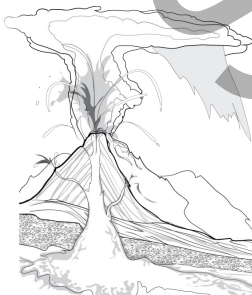


Mountains

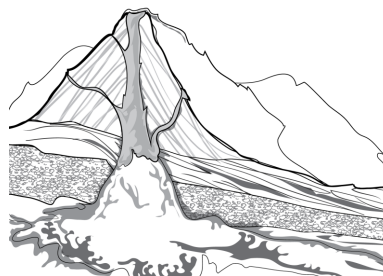


Mountains

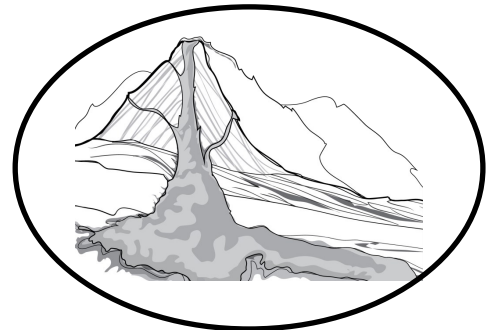
Which of the following is the name for a volcano scientists don't think will ever erupt again? Draw a circle around it.



Active



Dormant



Extinct

Can you name two signs a volcano may erupt soon?

Extremely hot water in rivers and lakes; gas leaking into hot springs that smells like rotten eggs; change in temperature of the gas at a fumarole or dead plants; landslide; change in shape