

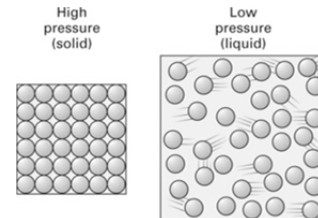
## VOLCANOS!

There are three things which can cause rock to melt in the asthenosphere, which is full of hot, plastic, but still solid, rock, that is right on the edge of melting.

*Increasing temperature* will cause most solids to melt. It is the least important of the three processes working to create melts in the asthenosphere.

*Decreasing pressure* allows atoms and molecules to move further apart.

Rock in the asthenosphere is under high pressure, which prohibits it from melting, even under the extreme temperature. As rock rises, and pressure is relieved, then hot, plastic rock can expand (by about 10%) to become liquid magma.



The *addition of water*, through tectonic processes such as subduction, will lower the melting temperature of rocks.

These three processes, either singly or in combination, cause abundant magma to form in three tectonic environments; **spreading centers, mantle plumes, and subduction zones**. These environments are where we get volcanos! The **Ring of Fire**, which is around the edges of the subducting Pacific plate, is where 75% of Earth's active volcanoes lie (excluding mid-oceanic ridge volcanoes)!

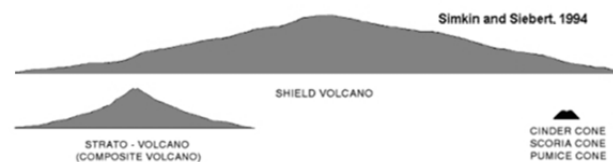


**Volcanos** are hills or mountains formed of lava and pyroclastic (of Greek origin; pyro –*fire*, klastos – *fragments*) rock fragments that have been erupted or ejected through a volcanic vent. Lava is magma that has flowed on the surface and the rocks that it forms. There are three main types of volcanos.

*Shield volcanos* form when fluid basaltic magma builds a gently sloping mountain. These types of volcanos, like Mauna Kea in Hawaii, can grow to an enormous size and normally are characterized by gentle eruptions with slowly advancing lava flows.

*Cinder cones* are small (usually less than 300m high), symmetrical cones of uncemented pyroclastic fragments. They're usually only active for a short amount of time as the eruptions are driven by accumulated gas and volatiles in the magma.

*Stratovolcanos, or composite cones*, tall, steep sided mountains formed from alternating sequences of lava flows and pyroclastic eruptions. These form along subductions zones, which supply a steady flow of magma and volatiles to volcano, and have repeated, often violent eruptions. Mount Vesuvius, in Italy, is an example of a stratovolcano and its violent, or **Plinian**, eruption in 79 AD destroyed the towns of Pompeii and Herculaneum.



Today, we're going to attempt to recreate three types of volcanic eruptions in lab!

### EXPERIMENT 1 - Hydrogen peroxide and yeast eruption

#### Materials Needed:

Quick rising yeast  
Measuring cups

30% sol hydrogen peroxide  
Sand

Soda bottle  
Dish soap

Soda bottle  
Food coloring

1. Place your soda bottle in the middle of your table.
2. Form the outside of your volcano using the sand and being careful not to get any sand or dirt inside your bottle.
3. Pour about a ½ cup of hydrogen peroxide into your bottle.
4. Add about 6 drops of red food coloring and 2 drops yellow food coloring.
5. Mix in two tablespoons of dish soap.
6. Mix a tablespoon of dry yeast with 3 tablespoons of water in small cup.
7. Pour the yeast mixture into your volcano and stand back!

**Answer questions about experiment 1 on your lab sheet.**

### EXPERIMENT 2 - Soda and Mentos Eruptions

#### Materials Needed:

Mentos

2-liter bottles of soda

Geyser Tube

Meter stick

Mentos candy is covered with tiny pits which become nucleations sites for CO<sub>2</sub> bubbles to form as the candy sinks to the bottom of the bottle of soda. The release of all the CO<sub>2</sub> gas is what drives the eruption.

1. Note the volume of your soda (it should be 2L) and amount of mentos given before you begin.
2. Place your soda bottle next to a wall outside.
3. Load your geyser tube with your Mentos.
4. Pull the pin and stand back!
5. Measure the height of your eruption (the wet spot on the wall).
6. Measure the amount of liquid left in your bottle.
7. Share results with groups that had more/less mentos.

**Answer questions about experiment 2 on your lab sheet.**

### EXPERIMENT 3 - BOOM

1. I got this one... Big boom!
2. Help clean up the big boom!

**Answer questions about experiment 3 on your lab sheet.**

### EXPERIMENT 1

1. Was your eruption gentle or violent (i.e. would tiny, tiny villagers be able to get away from your "lava" flow)?
2. What type of volcano would you expect this type of eruption from?

### EXPERIMENT 2

# of Mentos	Beginning Volume	Ending Volume	Height of Eruption
1	2L		
2	2L		
3	2L		
4	2L		
5	2L		
6	2L		

3. Which eruption went the highest?
4. Which eruption had the lowest ending volume?
5. The Mentos eruption is driven by the amount of CO<sub>2</sub> gas released into the soda. What type of volcano is driven by the amount of volatiles in the magma?

### EXPERIMENT 3

6. Was the eruption gentle or violent?
7. About how tall was the eruption?
8. How far did debris fly?
9. If this was a real volcano, how do you think the ash cloud, which would have remained suspended for several days, would have affected the surrounding area?
10. What type of volcano would you expect this type of eruption from?