

Volcano Notes

Lava's viscosity is influenced by temperature and the composition of the magma from which it comes.

1. What is viscosity?


Viscosity is a property of fluids which describes the resistance to flowing. High viscosity fluids don't flow well.

2. How does temperature influence viscosity?

Higher temperatures decrease the viscosity of a fluid.

3. "Pure magma" is runny when hot enough. What substance can be added to magma to make it more viscous?

Sand and mud. These materials contain silica (also described as silicates).

 tongan volcano

How and/or where magma is formed determines the lava's viscosity.

1. Lava that erupts in seafloor spreading boundaries is "pure". At seafloor spreading zones pillow lava is often formed. What does pillow lava look like?

Rounded, like toothpaste being squeezed from a tube.

2. Lava that erupts from hot spots is "pure". From where does this lava come?

This pure lava comes directly from the asthenosphere.

3. Lava that erupts from subduction boundaries is not "pure". How did it get contaminated?

The subducting oceanic plate carries with it water and sediments which have come from the continental rocks. These sediments are high in silica. When the plate begins to melt, the silicates are some of the first materials to melt.

4. Volcanic activity in a rift valley can produce both runny lava and viscous lava. Why is that?

As the magma moves through the continental lithosphere up to the surface, it can pick up silicates and/or become a bit cooler. So the lava is more viscous when it erupts.

Viscosity of lava determines the type of volcano and its kind of explosion.

1. A boiling pot of soup is a good comparison for runny lava and a non-explosive eruption. An exploding pressure cooker is a good model for an explosive eruption with viscous lava. How do these two models work?

Boiling pot



If we put tomato soup in the pot and turn the heat up high, the soup will boil up and over the edge of the pot. The soup will pour out all over the stove.

Pressure cooker



If we try to cook something like split pea soup in the pressure cooker, some of the little, hard peas can become stuck in the top "pipe" which lets some of the steam out. The pressure cooker becomes plugged up and the water vapor and steam pressure builds up until the pressure blows off the small top of the pressure cooker. All the soup escapes through this small opening coating everything in the kitchen!! It is a violent eruption!

2. How does water vapor and other gases influence a volcanic eruption?
Water vapor builds up pressure which causes the eruption to be very explosive, just like the pressure cooker.

3. Why are volcanic eruptions over hot spots not explosive?

The magma is pure coming directly from the asthenosphere. It has low viscosity and therefore is very runny. The volcano doesn't get plugged up and pressure doesn't build up inside the magma chamber.

4. Why are volcanic eruptions around the "Ring of Fire" (island arc and continental subduction boundaries) very dangerous?

The subducting oceanic plate melts and the magma which is formed is contaminated with silica and water.

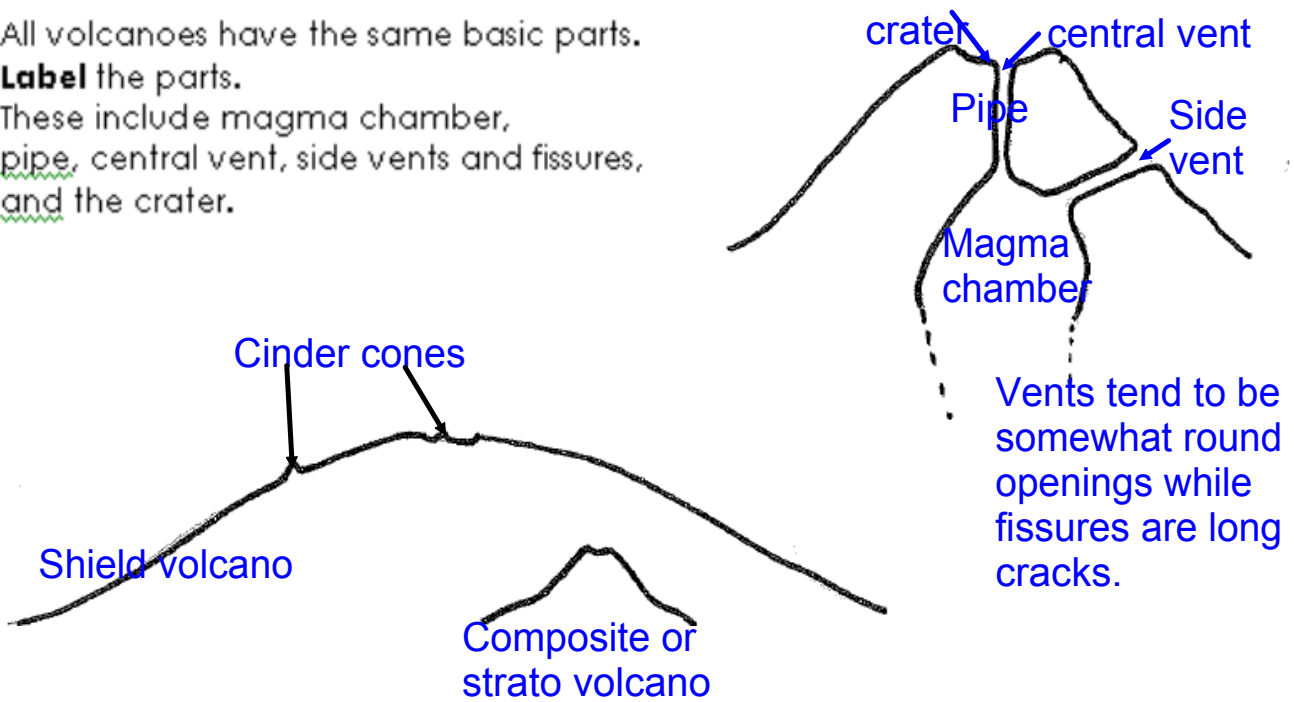
5. What is a pyroclastic flow?

When a subduction volcano erupts, most of the time the ash and hot gas is shot upwards. However, sometimes it is shot out to the side or can "flow" down hill. This very hot gas moves quickly and contains lots of ash and small hot rocks.

All volcanoes have the same basic parts.

Label the parts.

These include magma chamber,
pipe, central vent, side vents and fissures,
and the crater.



Vents tend to be somewhat round openings while fissures are long cracks.

These volcanoes are drawn roughly to scale. The shield volcano is often very large.

Attachments



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