



**VOLCANO**  
DISCOVERY

# Volcanoes

## Introduction to Earth Science

### Lab 08

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**Part A – Volcano Terminology**

Below are various volcanic terms that you must master in order to perform successfully on lab tests as well as lecture tests:

*volcano*

*magma*

*lava*

*pyroclastic*

*volcanologist*

*crater*

*flank*

*volcanic conduit*

*magma chamber*

*composite volcano*

*shield volcano*

*aa lava flow*

*pahoehoe lava flow*

*cinder cone*

## Part B - Viscosity and Volcanoes

The viscosity of a substance is its resistance to flow. Thus, the more viscous a lava, the less fluidity the lava has, therefore resisting flow. The viscosity of lava and its gas content determine the explosiveness of a volcano. In this experiment, you will explore various viscosities by comparing the behavior of water, vegetable oil, and molasses.

### Procedure- Viscosity

1. Observe the liquids provided for this experiment (water, vegetable oil, and molasses).
2. Based on your observation, which liquid flows the fastest? Which liquid flows the slowest?
3. Apply a small amount of each liquid to one paper plate. While tipping the plate and holding it at a 45-degree angle for at least two minutes, identify which liquid moves the slowest, the most intermediate, and the fastest down the plate.
4. How do you think that the ability of a liquid to flow is affected by its temperature? Provide an example of a liquid you heated which changed the viscosity.
5. Compare the viscosity of each liquid, and identify or rank which liquid is more, intermediate, or less viscous.

**Volcanoes and Viscosity**

1. How is viscosity related to the silica content of lava?
2. Using the table below, which type of lava would produce the least explosive eruption? Why?

	Basalt	Andesite	Rhyolite
<b>Silica content</b>	About 50%	About 60%	About 70%
<b>Viscosity</b>	Least	Intermediate	Most

3. Using the table and your answer from question 2, identify the type of lavas (lava composition) associated with:

Shield volcanoes

Composite volcanoes

4. Construct a table that compares the silica content, viscosity, volcanic environment, volcanic rock type, and volcanic morphology associated with shield, composite, and cinder cone volcanoes.

**Part C- Volcanism and Plate Tectonics (Work on at Home)**

1. Draw a diagram that represents the ocean-continent convergent boundary. In your diagram, include the subducted plate, and identify the type of volcanoes that form at this plate boundary. Provide at least 3 geographical locations that represent these types of volcanoes.
  
  
  
  
  
  
  
  
  
  
2. Draw a diagram that represents the ocean-ocean convergent boundary. In your diagram, include the subducted plate, and identify the type of volcanoes that are formed at this plate boundary. Provide at least 3 geographical locations that represent these types of volcanoes.
  
  
  
  
  
  
  
  
  
  
3. Draw a diagram that represents the divergent boundary. What types of volcanoes are formed at this type of plate boundary? Provide at least 3 geographical locations that represent these types of volcanoes.



**PART D – Volcanic Hazards**

**PART I – Map Exercise** using handout: Please fill in the map as follows. You are going to be drawing a volcanic hazard map for Popo. There are five major hazards associated with this particular volcano (**Question #1**). Please show these hazards on the map using the appropriate color for each hazard. Note the direction of the prevailing wind and the stream bed valley coming off the crater's slope.

- **Please attach a photograph of Popocatepetl to be turned in with this assignment!!!!**
- The first hazard associated with this volcano is large volcanic bombs that are injected from crater (top of volcano). These volcanic bombs are injected approximately 15 km downwind and 7.5 km upwind. Draw and color in the area, in orange, that is affected by volcanic bombs. What city is in serious threat of volcanic bombs? \_\_\_\_\_.
- Second, there is a prevailing ash cloud that extends up into the atmosphere that can cause serious problems for cities downwind of the eruption. The area affected by an ash cloud is approximately 75 km downwind of the volcano. Draw and color in yellow the area that is affected by the ash cloud. What large city will be covered by the ash cloud? \_\_\_\_\_; what industry is seriously affected by the ash cloud? \_\_\_\_\_.
- Third, look up the definition for lahar. Definitions are found in the "Glossary of Volcano and Related terminology" section of the USGS Website. Write out the definition for "lahar" below. \_\_\_\_\_

Lahars usually follow the path of a stream bed or V-shaped valley extended down from the crater. There is a prominent valley on the northwest side of volcano where a lahar danger exists. A lahar from the volcano would extend approximately 22.5 km from the crater and fan out towards the leading edge of the lahar. Draw in the projected path of the lahar in light brown. Lahars can also extend outside of the boundaries of the current stream bed channel. Do you think the City of Tiamaca is in danger of a lahar? \_\_\_\_\_

- Fourth, lava is usually the most dramatic hazard shown in movies; however, lava may not extend more than 7.5 km from the crater. The lava can extend down any side of the volcano; therefore, you must identify a circular lava hazard zone with a radius of 7.5 km from crater of the volcano. Please color in the lava hazard zone in red.
- Finally, by far, the most dangerous hazard associated with any volcano is a pyroclastic flow. What is the French name and meaning for this particular hazard? \_\_\_\_\_

Look up and write the definition of pyroclastic flow below:

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- Look up a "relief map" for this volcano using the *Smithsonian Website*. There is an UNAVCO Image on the website that shows the total relief of the volcano and the overall topography of the outlying area. There is a prominent valley that leads to a major city in the direct path of the pyroclastic flow. What city is in the direct path of this pyroclastic flow? \_\_\_\_\_  
Assume the pyroclastic flow follows the path of this valley for a distance of 60 km with a flow width of 15 km; draw in the pyroclastic path in violet. If the flow travels at 20 m/sec; how much time do you have before it reaches the city (minutes)? \_\_\_\_\_
- In addition, this particular volcano is littered with small green fissures located on the sides of the volcano called fumaroles. Please define what fumaroles are below and draw in a few locations on the south facing side of volcano in Parque Nacional Popo Izta. If you are having trouble visualizing these particular volcanic hazards, rent the movie "Dante's Peak."

#### Part I:

Say you were the Governor of the City of Tiamaca. Write a short paragraph on how you would set up an evacuation program or procedures if there was an eruption to occur at Popocatepetl (please use a separate sheet of paper)?

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