

<b>Why Do Some Volcanoes Go Boom? The Conditions of Volcano Formation</b> Earth Science <span style="float: right;">Mr. Traeger</span>
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Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

**Purpose**

The purpose of this worksheet/mini-lab is to familiarize the student with the conditions of volcano formation. Students will also become familiar with the types of volcanoes found worldwide.

**Materials**

- |                          |                           |                    |
|--------------------------|---------------------------|--------------------|
| ▪ Alka Seltzer®          | ▪ 3 Fuji® Film Containers | ▪ Water            |
| ▪ Disposable Dixie® Cups | ▪ 3 Straws                | ▪ 3 Plastic Pipets |
| ▪ Vegetable Oil          | ▪ Syrup                   | ▪ Stopwatch        |
| ▪ Textbook Chapter 13    | ▪ Igneous Rock Kit        | ▪                  |

**Part 1: Volcano Basics**

1. What is the definition of volcano?

2. Magma Formation: Fill in the chart below explaining the three conditions that allow magma to form in the asthenosphere?

Pressure Decrease	Temperature Increase	Increase of Water Content

3. Once magma has formed, what causes it to rise to the surface of the Earth? Think **Lava Lamp!**

4. Draw a diagram of a volcano below and label the basic parts

**Part 2: How and Where Volcanoes Form**

1. Define the following.

Active Volcano	Dormant Volcano	Extinct Volcano

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2. Using Section 9.1 of your textbook and remembering your plate tectonics knowledge, describe how volcanoes form at the following locations. Draw a diagram for your description.

Subduction Boundaries	Divergent Boundaries	Hot Spots

**Part 3: Alka Seltzer® Demonstration**

Watch the demonstration using Alka Seltzer®, water, and the film containers. This demonstration simulates varying gas content in magma and resistance of magma to flow. Answer the following.

1. How did the amount of Alka Seltzer® added to the film container affect the explosiveness of the volcano?+
  
2. What kind of gas was formed when the Alka Seltzer® was dropped into the water?
  
3. Compare the following volcanoes. Which one is more explosive? Which one is less explosive?

Volcano magma with a lot of dissolved gas	Volcano magma with little dissolved gas

4. How did the tightness of the seal on the containers affect the explosiveness of the volcano?+
  
5. The tightness of the seal on the film containers simulates resistance of magma to flow. The tighter the seal, the more resistance to flow. Which of the following conditions would be more explosive? Which would be less explosive?

Volcano magma with high resistance to flow	Volcano magma with low resistance to flow

**Part 4: Viscosity**

1. What is viscosity?

2. Set up the viscosity lab as modeled by Mr. Traeger. Fill in the following chart.

Liquid	Water	Vegetable Oil	Syrup
Time for all material to flow into cup? (seconds)			
Viscosity Rating? (low, medium, or high)			
Most like what kind of magma? (basalt, andesite, or rhyolite)			

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**Part 5: Types of Magma in a Volcano**

1. Look at sample numbers 1, 5, and 7 in your igneous rock kit. Fill in the following chart.

Sample Number	1	5	7
Rock Name?			
Color of Rock? (Felsic, Intermediate, or Mafic)			
Silica Content? (low, medium, or high)			
Formed in what type of eruption? (rarely explosive, sometimes explosive, usually explosive)			

**Part 6: Putting It All Together: Basaltic, Andesitic, and Rhyolitic Magmas**

1. Fill in the following chart based upon what you learned from the previous parts. *Hint:* Your book might be helpful here.

	Basaltic Magma	Andesitic Magma	Rhyolitic Magma
Silica Content? (Least, Intermediate, Most)			
Gas Content? (Least, Intermediate, Most)			
Viscosity? (Least, Intermediate, Most)			
Type of Eruption? (rarely explosive, sometimes explosive, usually explosive)			
Melting Temperature? (highest, intermediate, lowest) Remember Bowen's Reaction Series here.			
Locations found? (see book page 199)			

2. Explain why rhyolitic and andesitic magmas are associated with more explosive eruptions/pyroclastic flows, whereas basaltic magma is associated with less-explosive, fluid-type lava flow eruptions.

**Part 7: Lava Flows**

1. Describe the characteristics of each type of lava flow below.

pahoehoe	aa	pillow lava

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**Part 8: Ash and Rock Fragments**

1. What is pyroclastic material? Why is it so deadly?
2. Describe the characteristics and sizes (in mm) of each type of pyroclastic material below.

ash	lapilli	blocks or bombs

**Part 9: Volcanic Landforms**

1. Fill in the following information for each type of volcano.

Type of Volcano	Shield Volcano	Cinder Cone	Composite Volcano
Sketch the shape of the volcano and state the basic characteristics			
What is the height range? Does it have broad sides that extend far away from the center?			
Steepness (slope) of Sides? (gentle or steep)			
Formed where? (hot spot, subduction zone, divergent zone)			
What kind of eruption is formed? (explosive or gentle)			
What kind of magma/rocks would you find here? (basaltic, andesitic, or rhyolitic)			

2. What is a lahar? How are they formed?
3. What is a caldera? Think about Yellowstone NP, Crater Lake NP, and Mammoth.
4. How are calderas formed? Drawing a series of pictures as seen on page 329 would help.

Step 1	Step 2	Step 3
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