

Volcanoes

Overview: Mars has some of the biggest canyons and the highest volcanoes in the solar system. Valles Marineris measures 2,800 feet wide and 4 miles deep. That's 40 times the size of the Grand Canyon. And Olympus Mons is 15 ½ miles high, nearly three times the size of Mount Everest. So how does this happen? That's that this lab will help you figure out.

What to Learn: The reaction you are making today is similar to the action Mars saw with its shield volcanoes. The gas produced is carbon dioxide. The bubbles that get trapped inside make pockets, and the dish soap helps them stay as bubbles long enough for you to catch them in action.

Experiment

1. Do this lab outdoors, because of the mess it makes that seems to flow everywhere. Find a nice-weather day and do this outside. There are a couple of choices with this experiment. You get to pick what the volcano is made out of (there are two different dough recipes), and also which kind of chemical reaction you'd like to demonstrate (there are two different ones here, too). If you're in a hurry, use a slab of clay for the dough and use the first set of chemicals.
2. If you'd like to fill out the data table for their experiment (this is questionable, as it's going to be a messy lab), then you'll need measuring cups.
1. The first thing you will do is mix up volcano dough. There are two different recipes provided with this lab: Standard Volcano Dough is just like play dough, and Earthy Volcano Dough looks more like the real thing. Your teacher will let you know which one you are to make. Then proceed to the chemical reaction that your teacher has selected for you.

Making the Volcano

Standard Volcano Dough

- a. Mix together 6 cups flour, 2 cups salt, ½ cup vegetable oil, and 2 cups warm water.
- b. The resulting mixture should be firm but smooth.
- c. Stand a water or soda bottle in a roasting pan and mold the dough around it into a volcano shape.

Earthy Volcano Dough

- a. Mix 2½ cups flour, 2½ cups dirt, 1 cup sand, and 1½ cups salt.
- b. Add water by the cup until the mixture sticks together.
- c. Build the volcano around an empty water bottle on a disposable turkey-style roasting pan.
- d. It will dry in two days if you have the time, but why wait? You can erupt when wet if the mixture is stiff enough! (And if it's not, add more flour until it is.)

Chemical Reactions:

Soda Volcanoes

- a. Fill the bottle most of the way with warm water and a bit of red food coloring.
- b. Add a splash of liquid soap and ¼ cup baking soda. Stir gently.
- c. When ready, add vinegar in a steady stream and watch that lava flow.

Air Pressure Sulfur Volcanoes

- Wrap the volcano dough around an 18" piece of clear, flexible tubing.
- Shape the dough into a volcano and place in a disposable roasting pan.
- Push and pull the tube from the bottom until the other end of the tube is just below the volcano tip. If you clog the ends of the tubing with clay, just trim away the clog with scissors.
- Using your fingers, shape the inside top of the volcano to resemble a small paper cup.
- Your solution needs a chamber to mix and grow in before overflowing down the mountain. The tube goes at the bottom of the clay-cup space.
- Be sure the volcano is SEALED to the cookie sheet at the bottom. You won't want the solution running out of the bottom of the volcano instead of popping out the top!

Make your chemical reactants for Air Pressure Sulfur Volcanoes:

- g. *Solution 1:* Fill one bucket halfway with warm water and add 1 to 2 cups baking soda. Add 1 cup of liquid dish soap and stir very gently so you don't make too many bubbles.
- h. *Solution 2:* Fill a second bucket halfway with water and add 1 cup of aluminum sulfate (also called alum.) Add red food coloring and stir.
- i. Putting it all together: Count ONE (and pour in Solution 1) ... TWO (inhale air only!) and THREE (pour in Solution 2 as you put your lips to the tube from the bottom of the volcano and puff as hard as you can!) Lava should not only flow but burp and spit all over the place!

Soda Volcanoes Data Table

[illegible]

Air Pressure Sulfur Volcanoes Data Table

Note: Don't blow through the tube when taking your data.

How Much Solution 1?	How Much Solution 2?	How Long Did It React? <i>(measure in seconds)</i>

Reading

Have you ever noticed how lots of volcanic rocks have bubbles inside? The gas that bubbled up through the rocks as they cooled gives it a porous appearance.

What do you think would happen if the lava doesn't make it all the way out of the volcano? It cools and coats the inside, and then gets reheated with the next explosion. This can happen over and over again, making the lava undergo some pretty radical changes, molecularly speaking.

The reaction the kids are making today is similar to the action Mars saw with its shield volcanoes. The gas produced is carbon dioxide. The bubbles that get trapped inside make pockets, and the dish soap helps them stay as bubbles long enough for you to catch them in action.

Mars is a litter box for volcanoes. Some of these volcanoes are dead, but others are simply dormant. Nearly all volcanoes on Mars are shield volcanoes, created by currents and hotspots beneath the surface (just like the ones in Hawaii). There are so many volcanoes on Mars that scientists have drawn lines to corral them into volcanic provinces. Without tectonic plates, the currents under the volcanoes can flow easily and freely.

Exercises

1. How is this activity similar to the volcanoes on Mars?
2. What gas is produced with this reaction?
3. Which planets have volcanoes?

Answers to Exercises: Volcanoes

1. How is this activity similar to the volcanoes on Mars? (The bubbles that get trapped inside make pockets, and the dish soap helps them stay as bubbles long enough for you to catch them in action).
2. What gas is produced with this reaction? (Carbon dioxide)
3. Which planets have volcanoes, active or extinct? (Mercury, Mars, Venus, Earth, Io (moon of Jupiter), Triton (moon of Neptune), Enceladus (moon of Saturn), and our very own Moon.)