



# MoLab Mondays!

## *Volcanoes!!*

MoLab is excited to have the opportunity to stay in touch with our MoFamilies and continue to provide on-the-go, dynamic, hands-on, and inquiry-based science experiences through a mobile laboratory that promotes discovery. Our weekly activities will engage your little investigators with hands-on learning that proves anyone can think like a scientist.

Fire on the mountain!?! Cool! For our eighth installment of MoLab Mondays!, we are sharing an explosive experiment that is rockin' fun! This one is definitely going to be messy. We recommend you erupt your volcano outside or have lots of paper towels on hand. You are going to lava this one!

### **Tools & Materials:**

- Brown paper bag about the size of a lunch bag
- Empty 16.9 oz plastic bottle
- ¼ cup vinegar
- ¼ cup baking soda
- Food coloring
- Dish detergent
- Funnels
- Cake or pie pans
- Small cups (at least ¼ cup)
- Safety goggles (optional, but probably a good idea – vinegar can sting)
- Markers (optional)
- Paper towels

### **Constructing Your Volcano**

- Remove the lid from the bottle and place it bottom-down inside the bag. If the bottle seems unstable, you can tear or cut off the bottom of the bag.
- Shape and twist the bag around the top of the bottle. This step is to make sure your bottle will be stable and to give you an idea of the surface area available for decorating.

- Pull the bottle out of the paper cone. Optional, use the markers and your art skills to give the bag a more volcano-like appearance.
- Slowly fill the bottle with ¼ cup baking soda using a funnel and add a squirt of dish detergent.
- Mix ¼ cup vinegar with food coloring in a separate small cup.
- Carefully place the filled bottle back in the paper bag and loosely shape the paper bag so that it fits around the mouth of the bottle in a volcano-like cone.
- Place your volcano in the pie pan.
- Eruption time!!! Use a funnel to pour the vinegar mixture into the bottle and enjoy your VOLCANO!!

### **Make Observations and Ask Your Student**

- What caused your volcano to fizz?
- Why do volcanoes have a cone shape?
- How could you make the eruption bigger or smaller?

### **What's Going On?**

We have seen this type of reaction before. In March, MoLab Mondays! presented Fizzing Ice! Both the Fizzing Ice and Volcanoes are the result of a chemical reaction. A chemical reaction is when two or more things are combined to create something new. Just like the colorful results from Fizzing Ice, your volcano's chemical reaction was created by mixing the same ingredients. The volcano "erupts" as result of the baking soda combining with the vinegar.

This acid-base reaction is actually two reactions. Vinegar contains acetic acid and baking soda is also called sodium bicarbonate. The first reaction between the vinegar and the baking soda will result in carbonic acid. The carbonic acid is unstable and will immediately start to break down into water and carbon dioxide. The chemical equation looks like this:  $\text{NaHCO}_3 + \text{HC}_2\text{H}_3\text{O}_2 \rightarrow \text{NaC}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O} + \text{CO}_2$ . The fizzing you hear during the eruption is caused by the carbon dioxide gas. The dish soap captures more of the carbon dioxide for a foam-like effect. The food coloring is just fun!

Carbon dioxide is the gas we breathe out and the gas that causes our sodas to fizz. It is produced when we burn fossil fuels and is also one of the gases spewed by real volcanoes. Let us learn more about volcanoes!

### **Dig a Little Deeper**

Volcanoes are mountains, but not all mountains are volcanoes. Volcanoes are openings in the Earth's crust, that release ash, gases and steam, and hot liquid rock called lava. When the lava cools and hardens, it forms into the cone-shaped mountain we think of as a volcano. Most of the world's volcanoes are found around the edges of tectonic plates, both on land and in the oceans. On land, volcanoes form when one tectonic plate moves under another. Usually a thin, heavy oceanic plate subducts, or moves under, a thicker continental plate. When this happens, the ocean plate sinks into the

mantle. Water trapped in the rocks in this plate gets squeezed out. This causes some of the rocks to melt. The melted rock, or magma, is lighter than the surrounding rock and rises up. This magma collects in magma chambers, but it is still miles below the surface. When enough magma builds up in the magma chamber, it forces its way up to the surface and erupts. Some eruptions are explosive and some just ooze.

In the ocean, volcanoes erupt along cracks that are opened in the ocean floor by the spreading of two plates called a mid-ocean ridge. Magma from the Earth's upper mantle rises up to fill these cracks. As the lava cools, it forms new crust on the edges of the cracks. These mid-ocean ridges are actually long chains of underwater volcanoes that circle the Earth like the seams on a baseball. About 80 to 90 percent of all volcanic eruptions occur where the plates spread apart.

So, what causes volcanic eruptions? It is all a matter of chemistry. The way a volcano erupts depends on the amount of gas and silica (a molecule of silicon oxygen) in the magma below. Magma with lots of silica is thick and gooey, while magma low in silica is thin and runny. In magma with lots of gas, bubbles form as it rises. The more bubbles that form, the more explosive the eruption!

### Extension Activity Ideas

- Try the experiment again! This time add more baking soda and vinegar to the bottle. What happens when you add different amounts of each ingredient?
- Learn more about plate tectonics and discover where on the earth volcanoes are most likely to occur.



*Happy Experimenting from MoLab, Inc!*