

VOLCANOES – GRADE 6



OBJECTIVES:

1. Comparing igneous rocks.
2. Describe characteristics of igneous rocks.

VOCABULARY:

Dormant - a volcano that is temporarily inactive or “sleeping.”

Extinct - referring to a volcano that has been inactive for a very long time and will never erupt again.

Igneous - referring to rocks that were at one time melted and cooled.

Lithosphere - Earth’s crust and upper mantle.

Magma - molten fluid which may consolidate and cool into rock.

Plutonic Rock - rocks formed by cooling inside of a volcano.

Volcanic Rocks - rocks formed from lava or ash that cooled outside of a volcano.

Vesicular - Rock that is pitted with many cavities, known as vesicles, on its surface and inside.

PROCEDURE:

Activity 1: Is there a way to determine if a rock was formed inside or outside of a volcano?

Materials: *Volcano* slideshow; volcanic rock kit (Sierra granite, general granite, obsidian, scoria, pumice, gabbro, rhyolite); hand lenses

1. Go over slides 1-7 in the *Volcano* slideshow.
2. Have students use hand lenses to closely examine the volcanic rocks to see if the crystals are visible.
3. Use the illustration in the workbook to locate where on the volcano the rock was formed. Write down the number that corresponds to the locations and describe what the rock looks like. Have students state whether they are volcanic or plutonic. (Granites, gabbro are plutonic; obsidian, scoria, pumice are volcanic)

Igneous rocks look different because of two factors: they cooled at different rates and the "mother" **magma** (original melted rock) was different. In addition, volcanoes erupt in different ways. Some extrude quiet lava flows, while others explode violently, blowing lava into fragments of pumice or scoria. Geologists use these differences as criteria to name igneous rocks. Rocks that are cooled outside of the volcano are called **volcanic rocks**, and those that cool inside the volcano (**lithosphere**) are called **plutonic rocks**.

Magmas that cool at different rates develop different sized crystals. Quick cooling volcanic rocks such as lava are composed of small crystals. For example, basalt has small crystals

that can be seen under a microscope, inferring that basalt cooled quickly. Obsidian is also a volcanic rock, however, this rock cooled so quickly that no crystals had time to form. Slow cooling magma inside Earth creates plutonic rocks like granite, which is composed of large, visible minerals.

Some of the samples in this lab have a "holey" or sponge-like appearance. Geologists call this a **vesicular** texture and the holes are called vesicles. They form in lava that contains gas. As the pressure on the lava decreases near or on Earth's surface, the gas forms bubbles. This is physically similar to the bubbles that happen when a can of soda is opened. In the rock samples the students will see (pumice and scoria) the gas has long since escaped into the atmosphere, leaving the holes behind

Activity 2: Does the way a volcano erupts influence how an igneous rock is formed, and its appearance?

Materials: *Volcano* slideshow; California volcano rock kit (basalt, *Black Buttes*; basalt, *Gilroy*; obsidian, *Clear Lake*; scoria, *Clear Lake*; pumice, *Mono Craters*; andesite porphyry, *Inyo Mts*)

1. Ask the students if they think that one volcano can produce different types of rocks. (Refer back to slides 6 and 7 of *Volcano* slideshow if needed). Explain that not all volcanoes are the same (slides 8-11). Volcanic rocks differ in composition and eruptive style. Explain the differences in appearance between plutonic and volcanic rocks.
2. Discuss how to describe igneous rocks by offering the students the following words: bumpy, glossy, black, red, greenish, holey, grayish. Review any words that will help them describe the rocks further. Instruct students to find the locations where these rocks were formed by using the map of California. Give them the information below about each location. Ask them if there are enough data points to conclude if there is a pattern of volcanic rocks in California. **The answer is no.** You need more data points to make a conclusion.
3. Have the students compare the rocks from the different volcanic areas and describe them.

Here is information on each of the rock types:

Gilroy is south of San Jose. The volcanic rock records volcanism that occurred millions of years ago. The volcanoes are now extinct. The type of rock is basalt.

Clearlake is north of the San Francisco Bay Area. The volcanism in Clearlake was more recent than in Gilroy and were thought to be **extinct**, but recent studies may list this area as **dormant**. The type of rock is obsidian.

The Clearlake volcanoes also produced another type of rock called scoria, or a reddish looking rock.

Mono Craters, which produced pumice, is presently dormant. However the magma chamber below is still moving upwards and small earthquakes are common in the area.

Inyo Mountains are along the California-Nevada border north of Death Valley and south of Mono Craters. This rock is andesite porphyry and was deposited during the Jurassic. This volcanic complex has long been extinct.

Black Buttes is a cluster of overlapping lava domes produced by eruptions of Mt. Shasta over the past 10,000 years. Basalt rock reveals these volcanic origins.

The students should conclude that volcanoes produce different types of rocks. The samples that the students have are insufficient to conclude if there are differences between a quiet and violent eruption. However, students may see that some rocks are more "holey" which represents gas that was trapped in the rock, most common in a violent eruption.

Materials Provided

8 California Volcano rock kits:

Gilroy
Clearlake
Black Buttes
Mono Craters
Inyo Mountains

8 Volcano rock kits:

Granite
Gabbro
Obsidian
Scoria
Pumice
Rhyolite
Granodiorite

