# Igneous Rocks

## Overview

In this one-class-period activity, students work with six igneous rock samples to discover ways to recognize and classify them. The point of this activity is to recognize characteristics and use them to discuss how rocks formed. In this activity, students do not need to memorize the names of rocks.

This activity and those following are about recognizing characteristics and differences, and putting that recognition to use. They are not about rock and mineral names. Classifying rocks and minerals is rarely clear-cut, and is more useful in the field than in the classroom. Geology asks questions about how different rocks came to be, such as:

- How can limestone made of sea creatures be on a mountaintop?
- What could have heated and squeezed rocks enough to change them?
- How can igneous rocks be so different if they all come from melted rock?

Questions like these drove geologists to develop the theory of plate tectonics. Where possible, connect rocks and minerals to plate tectonics with attention to how different rock types formed.

## North Carolina Essential Science Standards

6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops.

## Background

Igneous rocks that are produced deep in the earth provide clues about conditions there. Likewise, igneous rocks produced at plate boundaries provide clues about how those boundaries behave. Igneous rocks result when molten rock (magma or lava) cools and hardens. Igneous rocks are classified according to mineral content, length of cooling time, and amount of gas in the molten rock. Metamorphic and igneous are the only rock types that have melted or partially melted. When metamorphic rocks melt, they become igneous. Chemical composition determines igneous rock color. Dark ones contain more magnesium and iron, lighter ones contain more feldspar and quartz, and some are intermediate in color. Another grouping is based on crystal size. The slower molten rock cools, the larger its crystals. Slowly cooled rock such as granite has clearly visible crystals, whereas rock that cooled quickly may have crystals so small you cannot see them. Igneous rock that cooled in stages may have crystals embedded in a non-crystalline matrix. Another grouping is based on bubbles or holes. Molten rock that contains water vapor or other gases produces igneous rocks with bubbles or holes.

## Materials

### Materials for the Teacher

- a teacher set of identified samples
- ability to project SD-3, Igneous Rock Stories
- a document camera to project a rock sample (optional)

### Materials for groups of 4

- 1 set of 6 igneous rock samples
- 1 copy of SD-1, Igneous Rocks Chart
- 1 copy of SD-2, Igneous Rock Identification Sheet
- 1 small pad of paper
- 2 hand lenses

### Materials for individual students

- Science notebook (provided by teacher)

## Preparation

1. Make a copy of SD-1, Igneous Rocks Chart and SD-2, Igneous Rock Identification Sheet for each team of 4.

## Exploration

1. Set up teams of 4 and provide each team with a small pad of paper and a set of igneous rock samples. Explain that these are called igneous rocks.
2. Without identifying the sample, choose an igneous rock from the teacher set for the whole class to look at. Either walk around the classroom to show every team, or project it with a document camera. Ask teams to find this sample in their box and place it on a piece of paper from their pad.
3. Ask teams to observe the rock closely and write as detailed a description of it as they can.
4. Discuss some of the characteristics that students observed.

## Procedure

1. Give out hand lenses. Students should still have their set of 6 igneous rocks. Ask teams to lay each sample out on a separate sheet of paper. On that sheet of paper, ask them to describe the rock carefully, including as many characteristics as they can. Ask them to do this with all 6 rocks.
2. Ask for observations. If students have read about igneous rocks, ask them to compare what they see with what they know about igneous rocks. If they have not read about igneous rocks, explain that igneous rocks come from molten rock that has cooled and hardened.

   Give each team a copy of SD-1, the Igneous Rocks Chart, and SD-2, the Igneous Rock Identification Sheet. Ask students to use the Igneous Rocks

Chart to place the rocks in the correct blank squares of the Igneous Rock Identification Sheet. Ask students to write observations in the boxes that helped them identify those rocks. As groups finish, ask them to look at other groups' placement of rocks and observations to compare with their own.

3. Ask for ideas about how some of the rocks look like they might have formed.
4. Project SD-3, Igneous Rock Stories, and go through the stories with the class. Let the class know that each story is about one of the rocks in their set of 6 igneous rock samples. Ask each team to predict which rock each story is about. Ask for reasons for the predictions. The Answer Key is below. Included with the answer key are some helpful YouTube videos and website images.

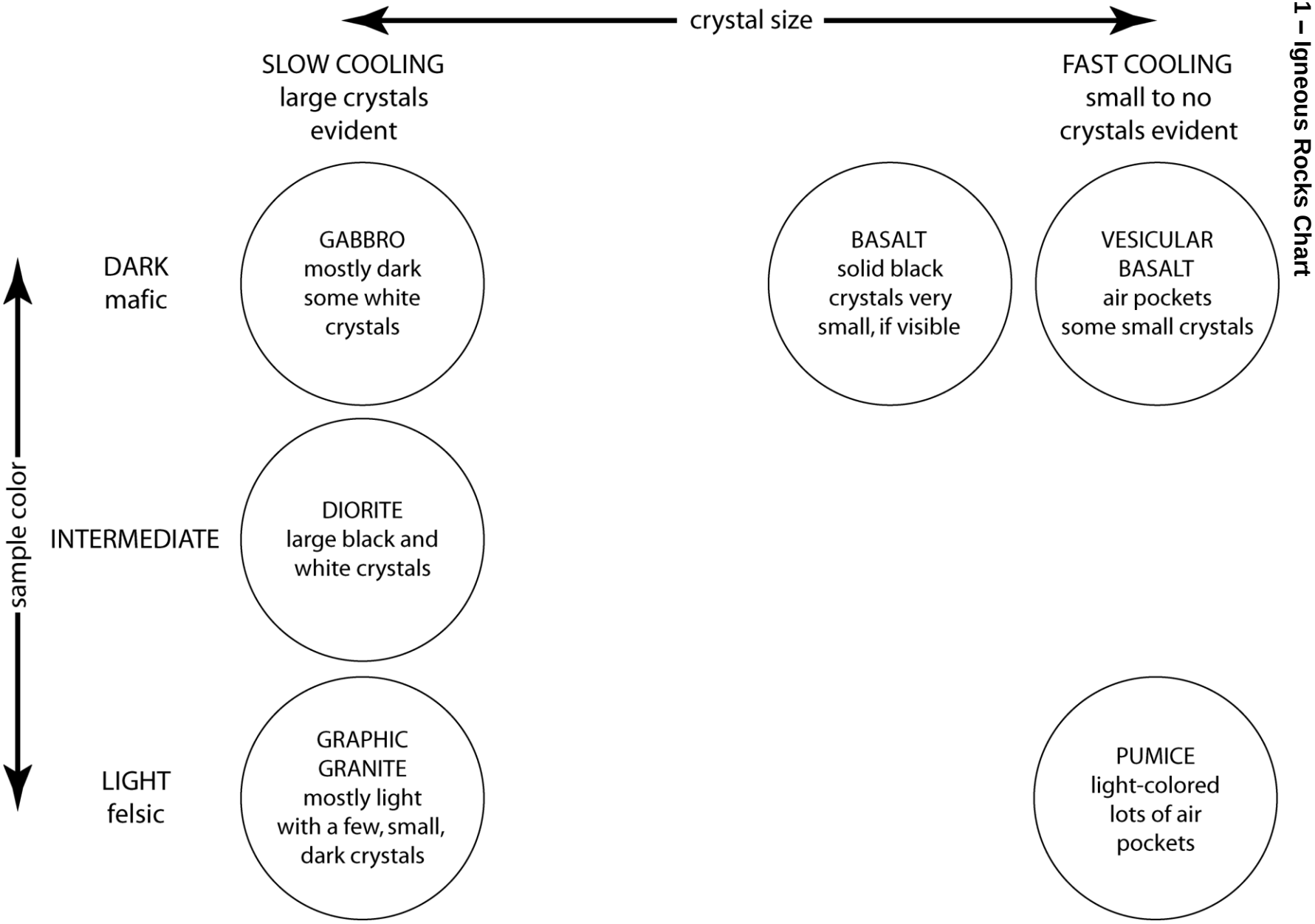
**ANSWER KEY**

Pumice is formed from volcanoes near or under the sea. When lava leaves a volcano, the pressure release can make it foam like carbonated soda, creating bubbles. When this super-heated lava contacts water, it cools into a solid almost instantly. As it quickly solidifies, it traps bubbles inside thin glassy walls. https://www.youtube.com/watch?v=HzwuTBx93uA

Gabbro is formed when molten magma slowly cools deep in the Earth, often below the sea. This magma pushes up and cools very slowly, over millions of years. Because it cools so slowly, it forms large crystals. The lava that creates gabbro contains little silica and no quartz, very different from granite. Large deposits of gabbro are in the crust under the oceans and also on the moon. Gabbro is used for kitchen countertops, where it is incorrectly called "black granite."
https://flexiblelearning.auckland.ac.nz/rocks_minerals/rocks/gabbro.html

Graphic Granite is formed when a large body of magma with high water content finishes cooling. It is called 'graphic' because it looks like writing. As the dark quartz and light-colored feldspar in the magma cool together, they slowly separate from each other. The quartz crystallizes along the edges of the feldspar crystals. Following the feldspar boundaries, the quartz forms dark shapes that look like writing. http://i.imgur.com/pkYhibi.jpg

# IGNEOUS ROCKS CHART



**SD 2 – Igneous Rock Identification Sheet**

| | |
|---|---|
| **Gabbro** | **Diorite** |
| **Graphic Granite** | **Basalt** |
| **Vesicular Basalt** | **Pumice** |

**SD 3 – Igneous Rock Stories**

## Story 1

This rock is formed from volcanoes near or under the sea. When lava leaves a volcano, the pressure release can make it foam like carbonated soda, creating bubbles. When this super-heated lava contacts water, it cools into a solid almost instantly. As it quickly solidifies, it traps bubbles inside thin glassy walls.

## Story 2

This rock is formed when molten magma slowly cools deep in the Earth, often below the sea. This magma pushes up and cools very slowly, over millions of years. Because it cools so slowly, it forms large crystals. The lava that creates this rock contains little silica and no quartz, very different from granite. Large deposits of it are in the crust under the oceans and also on the moon. It is sometimes used for kitchen countertops where it is incorrectly called “black granite.”

## Story 3

This rock is formed when a large body of magma with high water content slowly finishes cooling. The dark quartz and light-colored feldspar in the magma cool together and slowly separate from each other. The quartz crystallizes along the edges of the feldspar crystals. Following the feldspar boundaries, the quartz forms dark shapes that look like writing.