Lab Activity on Minerals

Introduction

Rocks are made of many mineral grains stuck together. These individual mineral grains range in size from microscopic to several feet in diameter. Unfortunately for earth scientists, most mineral grains are quite small (that's why they're called "grains"). In this lab, we will look at very large mineral grains and/or rocks made of small grains of just one mineral. These specimens will illustrate the basic physical properties of minerals exceptionally well. Once you have mastered the ability to identify the minerals in these exceptional specimens, you will learn to identify smaller mineral grains embedded in ordinary rocks. This skill is important because many rocks are classified by the minerals that they contain. We will spend two activity sessions on this lab.

Objectives

When you have completed this lab you should be able to

1. distinguish different kinds of minerals in the same rock.
2. determine the following types of physical properties of minerals: hardness, fracture, cleavage, streak, luster, reaction to acid, taste, and double refraction .
3. use these physical properties to identify 11 common minerals:

amphibole	chlorite	halite	quartz
calcite	feldspar	iron oxides (rust)	serpentine
clay	garnet	mica	

Activity #1: Analysis of Cookies

The "ingredients" of rocks are called minerals. Some rocks are made of just one type of mineral, but most rocks are made of several different types of minerals, all jumbled together. To ease you into the process of distinguishing minerals in rocks, you will first analyze and distinguish the ingredients in something much more familiar to you--cookies.

Materials: 4 different cookies per group
toothpicks
paper towels

Activity:

1. Break each cookie into pieces so that each member of the group gets a piece of each cookie.
2. Use the toothpicks to carefully pick the cookies apart and analyze how the four cookies are similar and how they are different.

Supported by NSF Grant #9455371. Permission is granted to reproduce this material for classroom use.

Questions:

1. Classify the cookies; i.e. give each cookie a name that clearly conveys what kind of cookie it is so that someone who couldn't see the cookie would instantly have a good understanding of what kind of cookie it is. Everyone in the group should agree to each of the names.

Cookie #1: _____

Cookie #2: _____

Cookie #3: _____

Cookie #4: _____

2. Write down all the ingredients that you think are in the cookies, including any ingredients you know are in there but you can't see.

3. Which ingredients can still be physically separated from the others? In other words, which ingredients still have their individual identities?

4. Apply this cookie analogy to rocks: Describe the relationships, in terms of "ingredients," among *rocks*, *minerals*, and *chemical elements*.

5. Write down what you think might be the history of how the cookies were made. Include your best guesses as to when the cookies were made and what processes the ingredients went through to make the cookies.

Activity #2: Analysis of Two Igneous Rocks

Introduction: The basic "ingredients" of rocks are called minerals.

- All minerals have a crystalline structure. In other words, the atoms that make up minerals are arranged in regular geometric patterns.
- In all specimens of the same mineral (quartz, for example), the **internal** geometric arrangement of the atoms is the same. However, it is possible for the **outsides** of two crystals of the same mineral to have quite different shapes, especially if they bumped into other crystals as they grew (for example, not all quartz crystals have a perfect six-sided prism shape).
- All specimens of the same mineral have a similar chemical composition. That is, all minerals can be broken up into ingredients called "elements" (some examples of elements are silicon, oxygen, and iron). There is some variation in the numbers and kinds of elements that make up minerals, just as there is some variation in the ingredients in chocolate chips, but that variation is within a limited range.

Materials: Two igneous rocks, labeled "A" and "B"

Activity: Carefully examine the two rocks.

Questions:

1. Rocks A and B are both of the same type of igneous rock. What type of rock are they?

   _____

2. Are rocks A and B plutonic or volcanic? _____
   How do you know?

3. Even though rocks A and B are similar enough to be considered the same type of rock, there are some differences. Describe these differences as clearly and accurately as you can.

4. Each rock contains three major types of minerals. Describe the color, shape and other characteristics of any major mineral(s) that the two rocks have in common:

5. Describe the color, shape and other characteristics of any major mineral(s) found in one of the rocks but not in the other.

Activity #3: First Attempt at Identifying Which Minerals are in a Rock

Materials: Two rocks, labeled "A" and "B"
12 minerals*, labeled as follows:

1) quartz	7) halite	13) chlorite
2) quartz	8) calcite	14) serpentine
3) quartz	9) calcite	15) amphibole
4) feldspar	10) clay	16) garnet
5) feldspar	11) mica	17) iron oxides (rust)
6) feldspar	12) mica	18) olivine

Activity: As best you can, match the three most common minerals in rocks A and B to the numbered mineral samples in the boxes. If you aren't sure (we fully expect you not to be sure at this point), list all of the possibilities.

Minerals in Rock A: 1. _____

2. _____

3. _____

Minerals in Rock B: 1. _____

2. _____

3. _____

*There are multiple examples of some minerals; you WILL NOT be asked to distinguish among multiple examples of the same mineral. We gave you several examples of some minerals so that you could see some of the variety within those mineral types.