

## Physical Science Laboratory: Identification of Minerals

**Objective:** After successfully completing this laboratory you will be able to identify several common minerals according to their properties.

**Materials:** 26-piece mineral set with a porcelain scratch plate, a small magnet, a magnifying glass and a dropper bottle of 3M HCl (hydrochloric acid).

**Instructions:** Obtain a box of minerals from the instructor and spread the samples out on the laboratory bench. These mineral samples have numbers painted on them. Arrange the minerals in numerical order. These numbers are for reference only and are NOT related to the Mohs hardness scale or any other mineral property. You should have 26 different mineral samples.

**Goal:** Your goal is to identify these minerals based on deduction and careful observation of their properties. Record your conclusions on the **MINERAL IDENTIFICATION CHART**

### Detailed Instructions – Step by Step:

1. Find the micas. There are two mica minerals; biotite and muscovite; in the mineral set. The micas can be easily recognized because they easily cleave into thin sheets. They look like “plastic”. One sample is dark due to the presence of iron (biotite) and the other is translucent -clear (muscovite). Record these names on the chart next to the correct numbers. Fill in the chart with the correct entries in each column.
2. Next find sulfur. Sulfur is easily recognized because it is pale yellow. Our samples are not crystalline – they are in the form of a clump – and they are opaque not translucent. If you rub the sulfur against the unglazed porcelain you might smell hydrogen sulfide (rotten eggs). Enter sulfur into your chart in the correct numerical slot. (1 sample)
3. Now look for galena. Galena has the chemical formula: lead sulfide (PbS). It is shiny and metallic and dense (seems heavy). It has cubic cleavage. You will see flat surfaces at right angles to each other (little cubes). It has a grey streak. Rub it on porcelain to see the streak. Add this mineral to the chart in the correct slot. (1 sample)
4. Now look at the minerals numbered 6,7,8,9 and 10. Three of these are different kinds of hematite: massive (opaque with poor crystal form), oolitic\* and specular (it sparkles). The other two samples are limonite and magnetite. Magnetite is a natural magnet. Your sample may attract a paper clip but our samples have weak magnetic fields. It is black and will stick strongly to a magnet. Use the streak test to find limonite. Limonite has a yellow-brown streak while hematite has a reddish brown streak. Magnetite and hematite are oxides of iron (rust), limonite is also an oxide but it contains some hydrogen so it is also part hydroxide. Add these iron ores to your chart. (5 samples)
5. Next separate out the following numbers: 1,2,3,4,5,11,16, 18 and 19. All of these samples are on the Mohs hardness scale. You will NOT find diamond, corundum (ruby), topaz or apatite in our mineral sets. This leaves talc, gypsum (two types: selenite and massive), calcite, fluorite, feldspar and quartz. Use the scratch test to identify the relative hardness of these minerals. Here are a few clues to help with identification. Calcite fizzes when a drop of hydrochloric acid is placed on it because calcite is calcium carbonate and the acid releases carbon dioxide gas bubbles from this mineral. Talc feels greasy and is very soft and easily crushed into powder (talcum powder). There are two types of quartz – one is translucent and crystalline and the other is milky and pink (rose quartz). There are two feldspar samples - one is pinkish and one is gray. The pink one is orthoclase and the gray one is plagioclase. (9 samples)
6. Next look for the pyrites. There are two of them. One is iron sulfide (pyrite) and one is copper iron sulfide (chalcopyrite). These minerals are referred to as “fool’s gold” because they look a little bit like gold. Iron sulfide has a more golden color while copper iron sulfide has a reddish or greenish hue. (2 samples)

7. Now carefully examine the remaining minerals. What remains is olivine (greenish), halite(salt, cubic cleavage), serpentine (snake like patterns), hornblende (black or greenish), sphalerite and garnet. Use available pictures to help you identify these minerals. (6 samples)

\* Oolites are tiny round spheres of chemically precipitated hematite.

**Luster: Dull, Metallic, Vitreous (Glassy), Resinous, Sparkling.**

**Streak: Record the color of the streak or write 'none'. Not all minerals will have a streak.**

**Hardness: Estimate the hardness using Mohs Hardness Scale.**

Mineral	Mineral Name	Luster	Streak	Hardness	Color	Any Other Characteristics
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

<b>Mineral</b>	<b>Mineral Name</b>	<b>Luster</b>	<b>Streak</b>	<b>Hardness</b>	<b>Color</b>	<b>Any Other Characteristics</b>
19						
20						
21						
22						
23						
24						
25						
26						

1. Which mineral was the hardest to identify and why?

2. Which mineral do you think is the most valuable and why?

3. Which mineral was the easiest to identify and why?

4. Which two minerals look the most alike and how can you tell them apart?