

# Sedimentary Rocks

**Overview:** Sedimentary rocks are broken into three different types: organic, chemical, and clastic. The Acid Test determines which rocks are clastic because they don't react with the acid. Here's another test to further determine the different kinds of clastic rocks by using the hardness scale.

**What to Learn:** Clastic rocks come in very different shapes and sizes, but they all have a few characteristics in common. A clast is a grain of sand, gravel, pebble, etc that makes up a rock. Clastic rocks look like they are made up of fragments of other rocks.

## Materials

- Small piece of plate glass
- Magnifying lens
- Vinegar
- Paper towel
- Shallow dish
- Rock samples (in the video: bituminous coal, sandstone, siltstone, shale)

## Experiment

1. Number and label your samples with your data table.
2. Take your hand magnifier and look closely at each sample and record the color information on the data table.
3. Use a dropper to take vinegar out of its bottle.
4. Drop a few drops onto your sample and watch for a reaction. If you see a reaction, note this in the data table and classify the rock as a chemical rock, not a clastic rock.
5. Wipe your samples dry with a clean, damp cloth.
6. Test the hardness of your sample with the nail and record it in your data table using Mohs' Hardness Scale.

# Sedimentary Rocks Data Table

*After you run your tests, circle the rock samples (in the left column) that are clastic.*

Sample	Color	Hardness (1-10)	Chemical or Clastic?	Name of Rock/Mineral?

## Reading

Clastic sedimentary rocks are fragments of other rocks. Geologists look at the tiny particle grains that make up the rock when they name the rock. For example, mudstone is named for its tiny particles of mud and clay, and sandstone is made up of larger grains of sand. The conglomerate rocks look like they are made up of pebbles. Siltstone under a strong magnifier show microscopic grains.

## Exercises

1. Give three types of clastic sedimentary rocks.
2. How can you tell a clastic from a non-clastic rock?
3. Does hardness determine a clastic rock? If so, what hardness do you expect a clastic rock to have?

# Igneous Rocks

**Overview:** Igneous rocks are classified as being extrusive or intrusive. An intrusive rock has a courser grain texture without a magnifier. Extrusive rocks need a magnifier to see the finer grains that make up the rock. Some extrusive rocks, like obsidian, need a microscope to see the fine grains.

**What to Learn:** There are two basic types of igneous rocks: intrusive and extrusive. Intrusive igneous rocks are the ones that crystallize below the Earth's surface, and these are the types of rocks that have large crystals like diorite, granite, gabbro, and peridotite. Extrusive igneous rocks erupt onto the surface of the Earth, like tuff, basalt, pumice, scoria, obsidian and andesite.

## Materials

- Penny
- Nail
- Streak plate
- Water in a graduated container
- Scale that measures in grams
- Longwave UV light source
- Sunlight



## Experiment

You're first going to classify your pile of rocks right using the data table on the very last page of this packet. Use the online videos that accompanied this packet to go through your own collection of rocks to help you classify them! (Can you name the rocks on this page? Which ones are extrusive and which are intrusive?)





**Basalt** is dark in color and has a very fine grain, and you'll find this on the surface of the earth so it's extrusive!



**Gabbro** has coarse grains, and its dark colored and forms under the surface of the earth, so it's intrusive.



**Pumice** has lots of holes, is light in color, and forms and cools quickly (the holes are from the gases trapped inside as it cools).

**Diorite** looks like a Dalmatian, with its coarse grains. It's formed inside the earth, so it is an intrusive rock that usually is a combination of feldspar, pyroxene, quartz and hornblende.



# Metamorphic Rocks

**Overview:** Metamorphic rocks are classified by as being foliated or non-foliated. Foliated rocks have layers, like bands around the rock. Non-foliated rocks don't have any layers are solid-looking throughout, although they might have crystals here and there. If the crystals are aligned to form a layer, then it's a foliated rock.

**What to Learn:** Metamorphic rocks come in very different shapes and sizes, but they all have a few characteristics in common. Foliated metamorphic rocks like gneiss, phyllite, schist and slate look layered and banded. Non-foliated metamorphic rocks like novaculite, marble, quartzite, and amphibolite don't have a banded or layered look to them.

## Materials

- Penny
- Nail
- Streak plate
- Water in a graduated container
- Scale that measures in grams
- Longwave UV light source
- Sunlight



## Experiment

You're first going to classify your pile of rocks right using the data table on the very last page of this packet. Use the online videos that accompanied this packet to go through your own collection of rocks to help you classify them! (Can you name the rocks on this page? Which ones are extrusive and which are intrusive?)







**Gneiss** is a metamorphic rock (see the layers/bands?) It's made up of smaller grains of minerals, usually quartz or feldspar.



**Quartzite** is a non-foliated metamorphic rock, made mostly of quartz. It's a hard, compact granular rock.

[Note: Quartz is silicon dioxide ( $\text{SiO}_2$ ) and is the most abundant mineral found at the surface of the Earth., and you'll find in all three types of rocks: igneous, sedimentary and metamorphic. ]



**Marble** is a non-foliated metamorphic rock that is mostly calcium carbonate ( $\text{CaCO}_3$ ), and it usually contains other minerals.



**Schist** is a foliated metamorphic rock that usually has a lot of mica fragments embedded inside, so you'll find it easy to split the rock into thin pieces.

# Rock Hound Hunt

**Overview:** This is the first of three “field trip” type of labs where students are given a pile of unlabeled rocks, and asked to identify them using the test techniques we’ve covered. The samples for this first set are easy to do since the samples are larger, and the instructional video walks you through every sample and how to tell which is which.

**What to Learn:** We’ve covered sedimentary, igneous and metamorphic rocks in your set by looking at color, streak, hardness, luster, chemical reactivity, and more! Let’s put your new skills to the test. It’s best to work right alongside the video as you go.

## Materials

- “Know Your Rocks” (also called “Learn Your Rocks”) set by Geoscience Industries, which includes the following samples: basalt, granite, pumice, rhyolite, diorite, gabbro, andesite, obsidian, bituminous coal, limestone, conglomerate, coquina, shale, siltstone, sandstone, dolomite, anthracite coal, soapstone, marble, amphibolites, quartzite, slate, gneiss, and schist. You can also use the smaller Washington Pack as well.
- Penny
- Nail
- Streak plate
- Water in a graduated container
- Scale that measures in grams
- Longwave UV light source
- Sunlight

## Experiment

You’re first going to classify your pile of rocks right along with the instructional step-by-step video. You’ll be testing for color, streak, hardness, density, luster, cleavage, fracture, tenacity, acid reaction, and fluorescence. Enjoy your first real geologist rock hunt!

## Rockhound Data Table

[illegible]

**Quick reference:**

- **Mohs' Hardness Scale:** fingernail: <2.5, penny: 2.5-3.5, steel nail (5.5), streak plate (7)
- **Density:**  $\rho = \text{mass} / \text{volume}$  (where mass is measured in grams, volume in mL)
- **Luster:** metallic, submetallic, glassy, adamantine, resinous, silky, pearly, greasy, pitchy, waxy, dull
- **Cleavage:** perfect, good, poor, none, and in how many planes: 1, 2, or 3?
- **Fracture:** conchoidal (like a shell), earthy, hackly, jagged, splintery, uneven
- **Tenacity:** brittle, sectile, malleable, ductile, flexible-elastic, flexible-inelastic
- **Acid Test:** Drop a few drops onto your sample and watch for a reaction. If you see a reaction, note this in the data table with a "Y". Otherwise, write "N" for no reaction.
- **UV:** Record the color you see when the sample is exposed to *longwave* UV light.