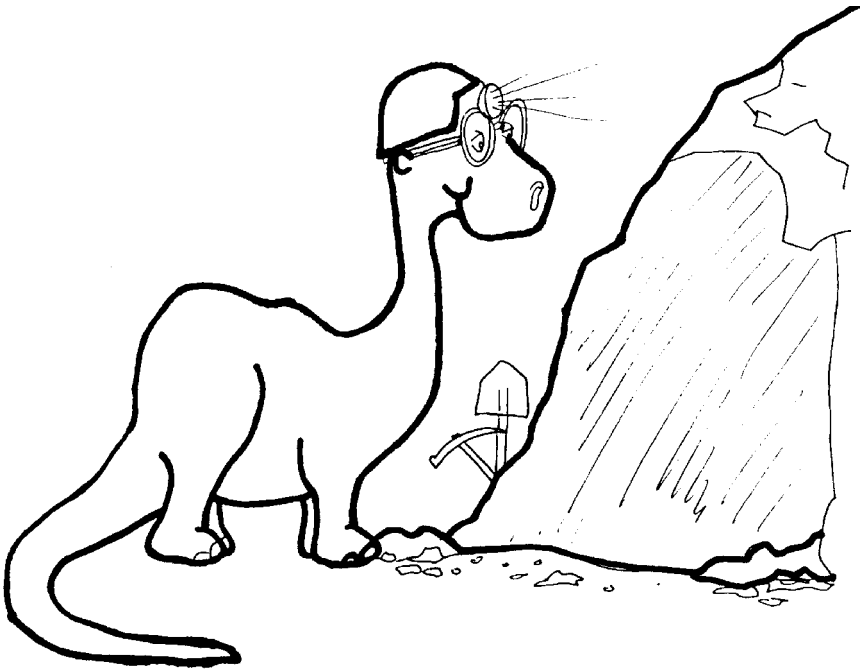
Rock Cycle

Understanding the Earth's Crust

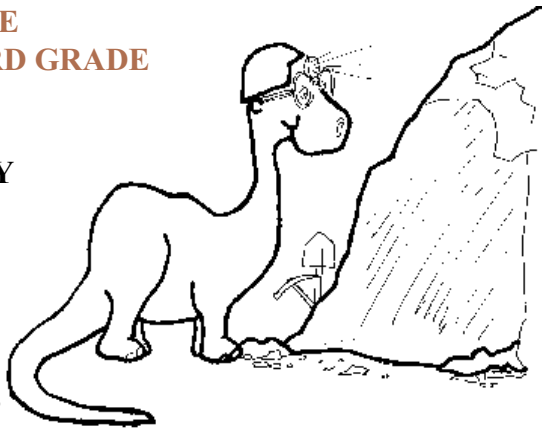
THIRD GRADE

ROCKS



2 WEEKS
LESSON PLANS AND
ACTIVITIES

ROCK CYCLE
OVERVIEW OF THIRD GRADE



CHEMISTRY

WEEK 1.
PRE: *Comparing elements of the periodic table.*
LAB: *Discovering properties of compounds.*
POST: *Exploring why elements combine.*

MINERALS

WEEK 2.
PRE: *Exploring the shapes of gems.*
LAB: *Comparing mineral shapes.*
POST: *Distinguishing the geometric shapes of minerals.*

WEEK 3.
PRE: *Distinguishing between crystalline and amorphous substances.*
LAB: *Discovering that all minerals are not crystalline.*
POST: *Exploring crystals.*

ROCKS

WEEK 4.
PRE: *Exploring the etymology of sedimentary, igneous, and metamorphic rocks.*
LAB: *Contrasting different types of rocks.*
POST: *Writing a creative essay on rocks.*

WEEK 5.
PRE: *Exploring agents of erosion.*
LAB: *Analyzing different types of sands.*
POST: *Comparing sand formed by wind and water.*

PAST LIFE

WEEK 6.
PRE: *Comparing different modes of fossilization.*
LAB: *Discovering information derived from organisms.*
POST: *Observing fossil and living organisms.*

ROCK CYCLE - ROCKS (3A)

PRE LAB

Students learn the meaning of the words igneous, sedimentary, and metamorphic.

OBJECTIVES:

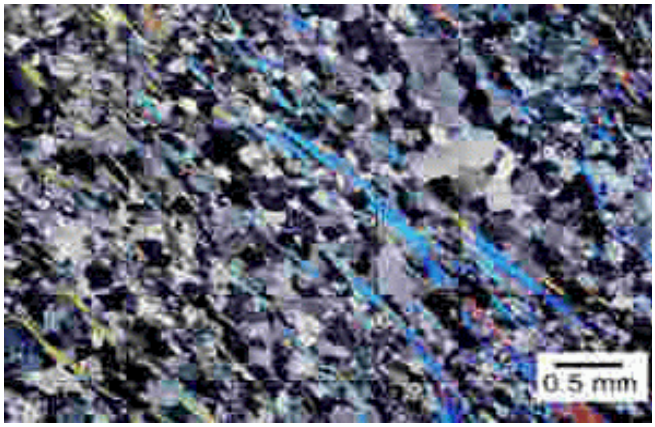
1. Comparing sedimentary, igneous, and metamorphic rocks.
2. Exploring the etymology of sedimentary, igneous, and metamorphic.

VOCABULARY:

igneous
metamorphic
sedimentary

MATERIALS:

Mineral and Rock Kit



Schist, a metamorphic rock in thin section.

BACKGROUND:

Minerals make up rocks. Rocks are formed in many environments upon and within the Earth's crust. There are three types of rock, each formed in a different way. Igneous rock , formed by the cooling of magma (molten rock) inside the Earth or on the surface. Sedimentary rocks, formed from the products of weathering by cementation or precipitation on the Earth's surface. Metamorphic rocks, formed by temperature and pressure changes inside the Earth. All three types of rock make up the Earth's lithosphere, the outermost layer. The lithosphere averages about 100 kilometers in thickness.

All igneous rocks began as magma (molten rock) which cooled and crystallized into minerals. Geologists classify igneous rocks based on both their crystal size and composition. Igneous rocks may look different because they may have cooled at different rates and the "mother" magma (original melted rock) was of a different composition. Variations in these two factors have created many different types of igneous rocks. When the magma cools at different rates, it creates different sized minerals. Quick cooling magmas have small minerals (with the exception of obsidian, which is actually composed of silica, but has no crystalline structure). Basalt, for example, has small minerals, most of which can only be seen under a microscope. Quick cooling lavas are called volcanic rocks. Magma that cools slowly creates rocks like granite, which have large minerals that can be seen with the naked eye. These igneous rocks cool inside the lithosphere, and are called plutonic rocks.

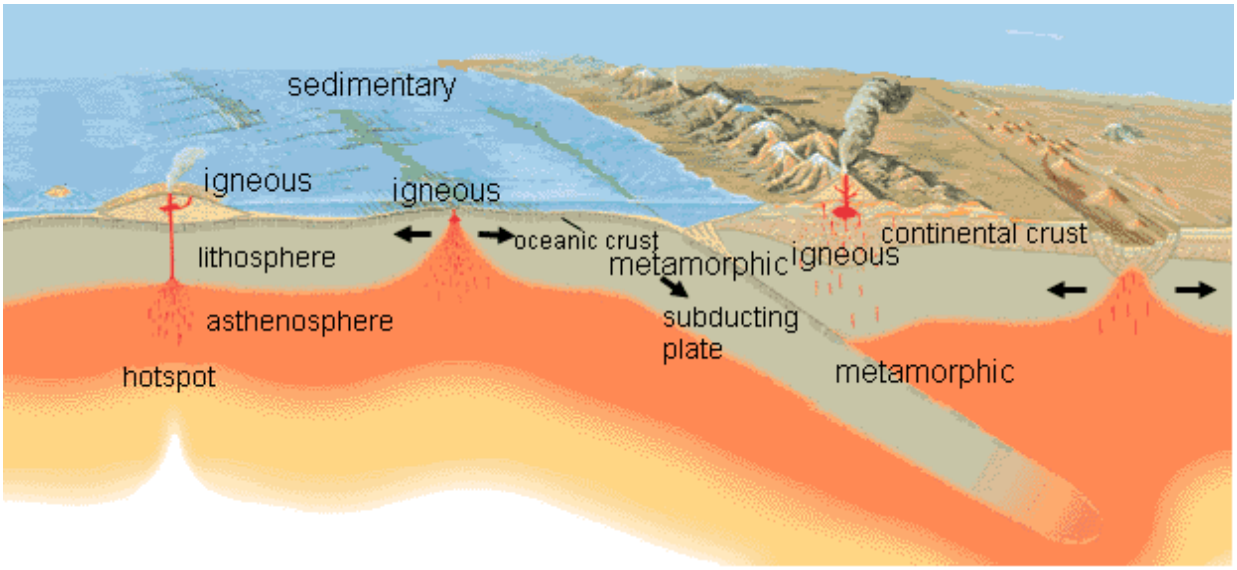
Sedimentary rocks form at the Earth's surface in two main ways. Clastic material (pieces of other rocks or fragments of skeletons) may become cemented together and chemical precipitation and evaporation can form sedimentary rocks. Sedimentary rocks

are usually associated with liquid water (which facilitates erosion, transportation, deposition, and cementation). However, sedimentary rocks may also form in dry, desert environments or in association with glaciers.

Metamorphic rocks are igneous, sedimentary, or preexisting metamorphic rocks that have been changed by great pressures and temperatures within the crust and upper mantle of the Earth. The temperatures were not enough to melt the rock, otherwise, an igneous rock would have formed. The pressures were much greater than those required to simply break the rocks into pieces. They were high enough to change the chemical make up of the rock by forcing the elements in it to "exchange partners." Different grades of temperature and pressure will cause the same original rock to form very different metamorphic rocks. Slate, which forms from the sedimentary rock shale, is very dense, smooth and does not contain visible minerals. However, if more pressure and temperature are applied to a slate, it could turn into schist, which has visible layers of minerals. If yet higher temperature and pressure are applied, the schist could turn into gneiss, which shows visible bands of minerals.

PROCEDURE:

1. Review with students where igneous, sedimentary, and metamorphic rocks are formed using the diagram below.



2. Ask students to find words which have *ign-, sediment-*, and *metamorphor-* roots. This may wish to use children's dictionaries, encyclopedias or other similar resources. This will help the students remember the meaning of the words igneous, sedimentary, and metamorphic. Here are some examples, along with suggestions for how to explain rocks to the students.

IGNEOUS -Fire or hot rocks, form when melted rock (magma or lava) cools. When magma cools slowly, large minerals are produced. In lava that cools quickly the minerals can only be seen with a microscope. *IGN = Latin for fire*

ignite
ignescent
ignis fatuus
ignition
ignitron
igniter

SEDIMENTARY - Sedimentary rocks are usually formed under water when grains of broken rocks are glued together. *SEDIMENT = Latin meaning to settle*

sedimentology
sedimentation

METAMORPHIC - Metamorphic rocks are rocks that once were igneous or sedimentary rocks but have been changed by pressure and temperature. *META = from Latin and Greek meaning to transform; MORPH = Greek meaning form*

metamorphism
metamorphose

3. Students can also develop nicknames for the rocks, and they can call the individual types of rocks: **IGNEOUS - fire or hot; SEDIMENTARY - cool, wet, fossil; METAMORPHIC - flat, squished, changed**

4. Using the Mineral and Rock Kit, show the students examples of the different types of rocks. Use the rocks in the kit to see if students remember what formed each of them. The written packet included with the kit should be consulted for more information on each rock.

ROCK CYCLE - ROCKS (3A)

LAB

Students describe the three types of rocks.

OBJECTIVES:

1. Learning certain characteristics of rocks.
2. Comparing and contrasting sedimentary, metamorphic, and igneous rocks.

VOCABULARY:

dense
fossil
glassy
igneous
metamorphic
mineral
sedimentary

Obsidian at Newberry Crater, Oregon

MATERIALS:

Rock Cycle - Rocks (3A)
hand lens

BACKGROUND:

Students have learned that there are three different types of rocks, each of which possesses different characteristics. However, rocks are difficult to identify because there are great variations in their appearance and composition. For example, the layers of sedimentary rocks are easily confused with the squished bands of minerals in metamorphic rocks. Likewise, fine-grained (volcanic) igneous rocks often resemble well-cemented sedimentary rocks.

Some features, however, are consistently useful for rock identification. For example, rocks that have a gritty feel (like sand paper) are usually sedimentary. Many igneous rocks show randomly oriented large minerals, especially those that have been cooled very slowly. Rocks that look “squished” are usually metamorphic.

The ambiguities in rock identification make the process fun. It is like a mystery. If students bring you rocks, which you cannot identify, have them ask several people until someone can identify it. The fun is in the research!

PROCEDURE:

1. Read the worksheet with the students so they understand the meaning of each

sentence. Have them then use the hints to try and match the rocks to the questions. If available, have students use a hand lens to observe the specimens. Encourage them to use other descriptive terms to help identify their samples. The key objective is for students to develop observational techniques that force them to think logically about selecting a rock that fits each description.

2. After students have worked through the lab sheet, go over each specimen and make sure the students understand the correct answers.

3. In conclusion, reinforce that there are only 3 major types of rocks (igneous, sedimentary, and metamorphic), but that there are hundreds of specific rock names. Each rock has its own characteristics. The students will learn to recognize various rock types by going through the process of formal identification of rock samples. Review how the different types of rocks are formed.

IGNEOUS

OBSIDIAN - Also known as volcanic glass. It is very hard, but more importantly it breaks into sharp edges that easily cut through many materials. Note that broken obsidian looks like broken glass. Obsidian occurs in almost any color, depending on what trace elements are present in it. Black and brown obsidian are most common. Obsidian is an amorphous solid; that, it is a solid rock composed of silicon dioxide, but this material lacks crystalline structures. It is one of very few exceptions to the rule that rocks are made of minerals.

PUMICE - Students will immediately notice that pumice is spongy or "full of holes." This characteristic makes pumice extremely lightweight; it even floats in water (you may wish to show this to your students). It is commonly light gray to blackish-gray in color. It is easily broken and has sharp edges. Like obsidian, pumice is volcanic glass; it thus looks glassy (especially with a magnifying glass) and lacks visible minerals.

SCORIA - Scoria is composed of volcanic glass and preexisting rock fragments that became incorporated into the magma as it erupted. The volcanic glass looks similar to pumice, but is reddish in color, because it contains more iron than pumice. Scoria lacks large visible minerals; small ones may be visible with a magnifying glass. Scoria is often sold as "lava rock" for use as a landscaping material.

GRANITE - Granite is composed of visible minerals, most commonly quartz, mica and feldspar. Quartz looks clear and glassy, mica is black and flaky, and the feldspars (commonly two or more different types are present) are either pale pink/orange or white in color. The relatively large size of the minerals indicates that the magma that formed the granite cooled slowly. This took place deep inside the earth, not on the surface, like pumice or scoria; it is a plutonic rock.

SEDIMENTARY

SANDSTONE - The gritty feel of the surface of sandstone hints that this rock was once sand that has been cemented together. Sandstones have quite varied compositions;

some are composed entirely of quartz, and others are mixtures of rocks, crystals and fossils. Almost any combination is possible. Sandstones thus come in a wide array of colors. By definition, the grains in a sandstone are “sand-sized”; most students will recognize this if you demonstrate "sand size” by showing them a bag of sand.

SHALE - Shale is composed of very small particles of mud, which have been compacted and cemented together. Individual mud grains are very small; they will rarely be visible. Shales are quite variable in color.

MUDSTONE WITH FOSSIL SHELLS - Mudstone is a variety of shale that is more massive. The samples in the kit contain marine fossils, indicating that these rocks formed in the ocean.

METAMORPHIC

MARBLE - Marble is composed exclusively of large commonly visible crystals of calcite. The gray/white bands in some of the samples are due to impurities within the calcite. Marble actually comes in a variety of colors, including black, gray, white, and pink. Marble, like all rocks that have calcite in them, fizz if you put a weak acid on it (usually 10% solution of hydrochloric acid). Marble forms when a rock containing calcite in it (such as limestone) was put under high temperature and pressure conditions. Marble has been used throughout history because it is easy to break and to carve.

SERPENTINITE - Serpentinite has a smooth, soapy feel, a green mottled color, and a somewhat flaky texture. It is composed mainly of the mineral serpentine. Serpentinite is so named because of its mottled color, which resembles the back of a sea-serpent. The geologic origin of serpentinite is still debated, but many scientists agree that it formed from a rock like basalt that was put under high temperature and pressure. Serpentinite is the state rock of California.

SCHIST - Schist is composed of visible minerals, mostly micas. Schists form under moderately high pressure conditions; this causes the naturally platy mica crystals to line up, giving the rock a platy look. This is a good example for illustrating the characteristic "squished" look of metamorphic rocks to your students.

4. Please note that rocks with the same name can vary in appearance. Geologists use other information besides appearance in order to identify rocks. For example, mineral compositions are key in determining the names of many rocks.

ROCK CYCLE - ROCKS (3A) LAB

PROBLEM: How can you classify rocks?

PREDICTION:_____

PROCEDURE: Using the following clues to identify each rock sample. Place the rock on a piece of paper with the number of the rock that corresponds with the questions below, so your teacher can check your answer.

1. This sedimentary rock is called **sandstone**. It feels "gritty" and looks like sand cemented together. Describe the specimen you think is sandstone.

_____

2. This igneous rock, called **granite**, has white and black minerals. Describe your specimen.

_____

3. **Schist** is a metamorphic rock with sparkly, flat minerals. Describe your specimen.

_____

4. **Fossiliferous mudstone** looks like mud with a clam stuck in it. Describe your specimen.

_____

5. This dark, glassy igneous rock is called **obsidian**. Describe your specimen.

_____

6. **Shale** is a flattened rock. Describe your specimen.

_____

7. This igneous rock is red, with holes and is called **scoria**. Describe your specimen.

_____

8. **Marble** is a whitish, gray metamorphic rock. Describe your specimen.

_____

9. **Pumice** is a very light igneous rock with holes. Describe your specimen.

_____

10. **Serpentinite**, a metamorphic rock, is green with a smooth feel. Describe your specimen.

_____

CONCLUSION: How many different types of rocks have you looked at? _____

Describe the rocks you have trouble identifying._____

_____

ROCK CYCLE - ROCKS (3A)

POST LAB

Students write a creative essay on rocks.

OBJECTIVES:

1. Writing a creative essay on igneous, sedimentary, and metamorphic rocks.
2. Constructing a fictional story using characteristics of a particular rock.

VOCABULARY:

igneous
metamorphic
sedimentary

MATERIALS:

Boat Ride with Lillian Two Blossom by Patricia Polacco
or other appropriate book
worksheet

BACKGROUND:

A myth is a traditional or legendary story, usually concerning some superhuman being, or an alleged person or event, with or without a determinable basis of fact or a natural explanation. A folk tale or legend is a myth originated by one group of people. The story becomes part of their oral tradition.

Stories about landscape caused by different rock structures are found throughout the world. In Hawaii, the volcano becomes a mythical object caused by the wrath of several "gods." In ancient Greek and Rome, you had many of their myths built on the fire of volcanoes. Native cultures from Mexico and the United States had stories around the rocks formed from volcanoes. "Apache tears" tells of a story of an Indian warrior who lost his love, and he cried tears of obsidian.

Rocks form wondrous patterns, whether associated with weathering (sedimentary rocks) or with the original flows (igneous rocks). How they become so awesome, remains the source of many legends.

PROCEDURE:

1. In this activity, the students will write their own myth, folk tale or legend dealing with one of the rocks that they observed during the lab. You may want to give the students the following background information to help them get their imaginations "in

gear." Instruct the students to write a paragraph-length story about one of the rocks that they observed during the lab.

2. Before they write, you may wish to read the book *Boat Ride with Lillian Two Blossom* to the students. In the story, a fantastical boat ride sweeps the children Will and Mabel and their goat Banana Joe up into the sky. Their guide, the surprising Lillian Two Blossom explains where the sun, wind, and rain come from. A wonderful skyward adventure is a classic child's dream. The wise Lillian is the perfect guide. Although this book is not specifically about rocks, it opens a child's mind to many imaginative possibilities.

3. In addition, to stimulate their writing, you may wish to tell the students some or all of the characteristics of the lab specimens given below.

SERPENTINITE - The name is derived from the green mottled, serpent-like color.
SANDSTONE - Little bits of other rock have been cemented by Mother Nature.
GRANITE - Baked and cooled deep inside the Earth, it rises to form large mountains.
SCHIST - Mother Nature sat on this rock and squished it.
FOSSILIFEROUS MUDSTONE - The mud that the clam lived in at one time became hard. The rock rose out of the sea and became a rock.
SHALE - Small, little particles of mud that settled out of the water and were cemented together by Mother Nature.
OBSIDIAN - Indians used the sharp, blade like edges for arrowheads.
SCORIA - A volcano erupted violently. A red rock formed from the explosion.
MARBLE - An artist needs a rock so he/she can carve it into a statue. The artist picks marble.
PUMICE - A gas explosion from a volcano produced a rock that is light and fluffy and full of holes.

4. Use the worksheet to help guide your students to write a creative essay on the prince and the rock.

ROCK CYCLE - ROCKS (3A) POST LAB

Write an essay using the picture and lead sentence.

Lead Sentence:
The prince picked up a rock and it
sparkled.

ROCK CYCLE - ROCKS (3B)

PRE LAB

Students simulate weathering using a specimen of mud.

OBJECTIVES:

1. Comparing the forces of weathering.
2. Exploring agents of weathering.

VOCABULARY:

erosion
grain
igneous
metamorphic
sedimentary

MATERIALS:

water bottle
Sample of hard mud
hand lens or microscope

BACKGROUND:

Weathering is the wearing away of rocks on the Earth's surface by wind, water, ice, and heat. It is the first step in the formation of a sedimentary rock. Wind is responsible for wearing away rocks and creating great deserts like the Sahara Desert, Africa, an environment where water is not abundant. Water is responsible for wearing away of rocks in rivers, lakes, and the oceans. Ice is responsible for glacial erosion such as in Alaska, because as the ice moves, it carries rocks, which grind wears away the rocks beneath the glacier.

Climate also effects weathering. For example, in wet areas, water fills the cracks in rocks. When the temperature drops below freezing, the water in the cracks turns into ice. The ice expands, and forces the cracks apart. The ice then melts as the weather warms up. The rock thus becomes weaker and the crack wider with each successive freeze-thaw cycle. It eventually breaks apart into many pieces. Moreover, as a result of this process, concrete and asphalt in states like New York do not last as long as in warmer states like California.

As rocks are worn down by the weathering, broken pieces fall away from the parent rock and are further reduced in size through collisions with other rocks and additional weathering. Sand consists of small pieces of rock that have been eroded from a parent rock.

PROCEDURE:

1. Review the three major types of rocks with the students. Igneous or "hot rocks" are melted rocks that cool. Sedimentary or "wet rocks" are mainly formed by particles that are cemented together. Metamorphic or "changed rocks" are igneous, sedimentary or metamorphic rocks that chemically or physically change due to temperature and pressure.

2. Explain that weathering is the first step in the formation of a sedimentary rock. Tell the students that there are many types of weathering.

3. Demonstrate weathering by placing a hard piece of mud on a plate and squirting it with water. The water that hits the mud turns a dirty color. The mud loses pieces as the water penetrates the mud and loosens the particles.

4. Give students an opportunity to examine the muddy water with a hand lens or microscope. Mud flakes will be easily visible. Mud particles are much smaller than sand particles. Sand is formed similarly because the agents of erosion (not just necessarily water alone) eroded away pieces of rock from the “mother rock.”

ROCK CYCLE - ROCKS (3B)

LAB

Students compare rocks with sand.

OBJECTIVES:

1. Comparing different sand samples.
2. Contrasting the components of sand.

VOCABULARY:

basalt
chert
erosion
granite
quartz
serpentinite

Colorful sand grains from Rodeo Beach, California.

MATERIALS:

Rock Cycle - Rocks (3B)
round Avery labels
index charts
hand lens
Swift GH Microscope
crayons (optional)

BACKGROUND:

Erosion is the removal of weathered material on the earth's surface by to the action of wind, ice, heat, water, and humans. The agents of weathering break apart parent rocks into smaller fragments. These fragments may become sand if sufficiently broken down. Small rock pieces become smaller through movement, as they hit other rocks and chip away. Since sand comes from a "Mother" or source rock, it is possible to determine what type of rock produced the "baby rocks." The composition and general color of both the "baby" and "mother" rock are often very similar.

PROCEDURE:

1. Show examples of "mother" or source rocks to the students (granite, chert, serpentinite, and basalt). Describe the origin of each source material to the students. Be sure to point out that quartz is a mineral and not a rock.

There are five possible source materials for the sand in this lab. Granite is a

plutonic igneous rock. It occurs in varying shades of light and dark colors depending on the specimen's mineral composition. Serpentinite is a metamorphic rock that is smooth, green, and scaly. It is the state rock of California. Chert is a sedimentary rock that forms from the shells of microscopic marine life in deep ocean environments. It is very hard, and comes in many colors. Quartz is found in many rocks including granite and chert, and is the main constituent of most sand. Most quartz crystals are clear or white in color. Basalt is a dark, fine-grained igneous rock.

2. The students will describe the different types of sand by looking at the sand using a hand lens and microscope. Each sand will resemble the mother rock because the sand is of the same composition as the mother rock.

3. The students will be using hand lenses so you may want to show them how to use the lenses. Remember the hand lens should be close to the eye and then move the object into focus. Have the students observe the samples and describe them using the words found on the lab sheet. Tell them to be very descriptive as this will help them decide which sands may be related.

4. Have the students also look at the sand under the microscope to look for more details. Give students an index card. Make them write the name of each sand they are looking at. With an Avery label (round is preferred) have them put a little sand on the "sticky" side and then paste it to the index card next to its appropriate name. Look at these sands under a Swift-GH Microscope.

5. Rodeo Beach, Cleone, and Bodega are related because they have varying amounts of chert, serpentinite, basalt, and quartz in them. Half Moon Bay, Monterey, and Montara are similar because they have pieces of quartz, feldspar (pink, orange, or white) and small black minerals in them.

BODEGA, Sonoma County, California - .25-5mm; poorly sorted; subrounded to angular. Contains chert, basalt, serpentinite, quartz, feldspar, and greywacke. Along the Sonoma coast, you can see the high energy waves eroding the rocks along the coast. The common rocks in this general area are basalt, serpentinite, chert, and greywacke. The quartz and feldspar are eroding from the chert or the greywacke.
CLEONE, Mendocino County, California -.25-0.5mm; well sorted; subangular - subrounded. Contains quartz, feldspar, serpentinite, chert and basalt. The dark color is due to over abundance of basalt, serpentinite and chert. Also may contain pieces of shell material. Type of rock in area are basalt, serpentinite and chert.
HALF MOON BAY, California - 0.1 - .25 mm; very well sorted, subangular to subrounded. Contains quartz, feldspar, mica and minor magnetite. The cliffs along Half Moon Bay reveals the Mother Rock for this sand. The cliffs releases millions of sand grains to re-enter the rock cycle.
MONTARA BEACH, California - 0.1 - 7mm; very poorly sorted; subrounded. Contains

quartz, feldspar, and small pieces of granite with mica and hornblende. This sand is eroded directly from granitic rock very close to the beach. This is near the famous "Devils Slide" area, where very badly weathered granite has created very spectacular cliffs.
MONTEREY, California - 025 -7mm; very poorly sorted; subangular. Contains quartz, feldspar and pieces of granitic rock. The Mother rock is a granite, but unlike Montara Beach sand, Monterey has not been chemically weathered. Abrasion of large boulders of granite along the coast have mechanically broken this sand.
RODEO BEACH, Marin County, California -0.1 -7mm; poorly sorted; angular - rounded. Contains chert, serpentinite, quartz, basalt, magnetite. This beach is in a cove behind the Golden Gate Bridge, where very high energy waves erode the rocks exposed along this coast. The source rocks include chert, serpentinite, and basalt.

6. You may want students to draw a picture of each of the sand samples and color the grains the color that they see. This will help them really look at the different sands more carefully.

ROCK CYCLE - ROCKS (3B) LAB

PROBLEM: Can sands from different areas be related?
PREDICTION: _____
MATERIALS: Swift-GH Microscope, hand lens, sand samples
PROCEDURE: Sand reflects the type of rock that it came from. Let's look at 7 sand samples from California and try to figure out if they are related. Take out the sand only when your teacher tells you to. Use the following words to help describe the sand samples: shells, small grains, large grains, quartz or white to clear, grains of sand, chert or red to brown grains of sand, serpentinite or green grains of sand; gray or basalt grains of sand

SAND	DESCRIPTION
Rodeo Beach	
Half Moon Bay	
Cleone	
Bodega	
Montara	
Long Beach	
Monterey	

CONCLUSION: Which sands do you think are related? Why? _____
_____

ROCK CYCLE - ROCKS (3B)

POST LAB

Students write a poem using sand to help create images.

OBJECTIVES:

1. Comparing sand formed by wind and water.
2. Writing and reading poems on sand.

VOCABULARY:

erosion

MATERIALS:

none

BACKGROUND:

Montara Beach Sand, California

The agents of erosion (water, wind, ice, heat) remove particles from a parent rock. These loosened particles are named by their size. Large particles are called boulders and cobbles, smaller particles sand, and the smallest silt and mud. When weathering and erosion begin, the loose material consists of a wide range of particle sizes. However, as erosion progresses, the larger particles break down to smaller sizes. The amount of sand thus increases as erosion continues. Geologists have assigned specific particle diameters to each of these categories.

Sand has been used to describe many human qualities. A vagabond has been referred to as "driftless like ...sand;" endless time is "sand that drifts forever;" we are all but a "grain of sand on the beach." Children can spend endless hours on the beach, creating sand castles, or digging to reach the other end of the world. It can cover you up, but not make you dirty. Sand is clean to play with. Children look at sand falling through an hour glass fascinated by every grain that falls and some paint with different color sands to create works of art. Sand is loved so much by children that adults have created sand boxes, so their children can play.

Its funny to think that sand can be associated with two very opposite climatic conditions. Water that crashes upon beaches along the ocean, lake or river with the hot sun and wind that shifts sand in deserts like Death Valley and the Sahara Desert. But if you understand the process that creates sand, you can see that in both situations some kind of erosion of the surrounding rock is creating the sand.

Sand is but the Earth in miniature. Every rock which makes up the earth, succumbs to erosion and will become sand with time. (This process is part of the rock cycle.) Mighty mountains are slowly chipped away by natural forces like wind and rain; and over long periods of time, the mountains will become sand.

PROCEDURE:

1. Read the following two poems to the students.

LITTLE THINGS - *Julia A. Fletcher*

Little drops of water,
Little grains of sand
Make the mighty ocean
And the pleasant land.

Thus the little minutes,
Humble though they be,
Make the mighty ages
Of Eternity.

.

SAND DUNES *- Robert Frost*

Sea waves are green and wet,
But up from where they die
Rise others vaster yet,
And those are brown and dry.

They are the sea made land
To come at the fisher town
And bury in solid sand
The men she could not drown

She may know cove and cape,
But she does not know mankind
If by any change of shape
She hopes to cut off mind.

Men left her a ship to sink:
They can leave her a hut as well;
And be but more free to think
For the one more cast-off shell.

Discuss the poems with the students. Point out that both poems deal with erosion.

2. Following your discussion you may have students write their own "erosional poems." This activity might be more successful if students work in small groups.