

Rock Identification

Adapted from Don Peck
Mineralogical Society of America

Table of Contents

General Information	2
What Are Rocks?	2
What Types of Rock Are There?	2
What is the Rock Cycle?	3
What Minerals Form Rocks?	3
Collecting Rocks	4
Safety While Collecting Rocks	4
The Rock Identification Key	5
About the Rock Identification Key	5
Using The Rock Key	5
The Rock Key	7
Mineral Descriptions	10
Metamorphic Rocks	10
23. GNEISS (nice)	10
24. SCHIST (sh-ist)	10
25. MARBLE (mar'-bul).....	10
26. QUARTZITE (kwart'-zite).....	11
27. SLATE (sl-ate).....	11
28. SERPENTINITE (Sir'-pen-tin-ite).....	11
Igneous Rocks	12
29. RHYOLITE (rye'-o-lite).....	12
30. GRANITE (gran'-it)	12
31. DIORITE (die'-or-ite).....	12
32. BASALT (buh-salt').....	13
33. DIABASE (die'-uh-base).....	13
34. GABBRO (gab'-row)	13
35. PUMICE (pum'-iss).....	14
36. SCORIA (score'-ee-uh).....	14
37. OBSIDIAN (obb-sid'-ee-an)	14
Sedimentary Rocks.....	15
38. SANDSTONE (sand'-stone)	15
39. SHALE (sh-ale).....	15
40. LIMESTONE (lime'-stone)	15
41. CONGLOMERATE (cun-glom'-er-at).....	16
42. BRECCIA (brech'-ee-uh)	16

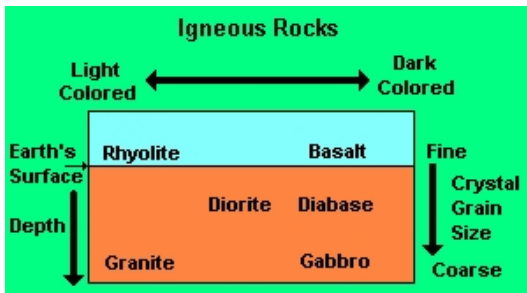
General Information

What Are Rocks?

Rocks are what the crust of the earth is made of. They are the mountains and the bottom of the ocean. They are everywhere on earth, but often buried under soil. Rocks are made of minerals, like quartz, calcite, feldspars, and micas. Most rocks are made from more than one mineral, but there are quite a few kinds that are made from only one mineral. Minerals are not rocks, rocks are made of minerals. A car is made of steel, glass, and plastic. A rock is like the car, a mineral is like the steel, or glass, or plastic.

What Types of Rock Are There?

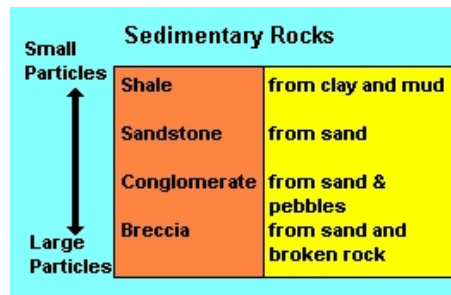
There are three different types of rock:



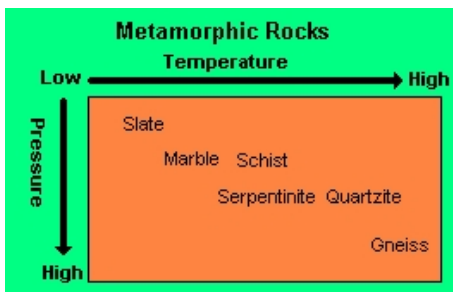
Igneous Rock is formed when a magma cools underground and crystallizes or when it erupts unto the surface of the ground, cools and crystallizes. Magma that erupts onto the surface is called lava. When magma cools slowly underground the crystals are large enough to see. When it cools quickly on the surface, the crystals are very small and you would need a magnifier or a microscope to see them. Sometimes, when the magma cools very quickly, it forms a kind of

black glass that you cannot see through.

Sedimentary Rock forms from particles, called that are worn off other rocks. The particles are sand and clay. Sand has the largest particles while the smallest. If there are a lot of pebbles mixed sand, it is called gravel. The sediment gets rock by being buried and compacted by from the weight above it. Another way it rock is from being cemented together by that has been dissolved in water. Often, both and compaction take place together.

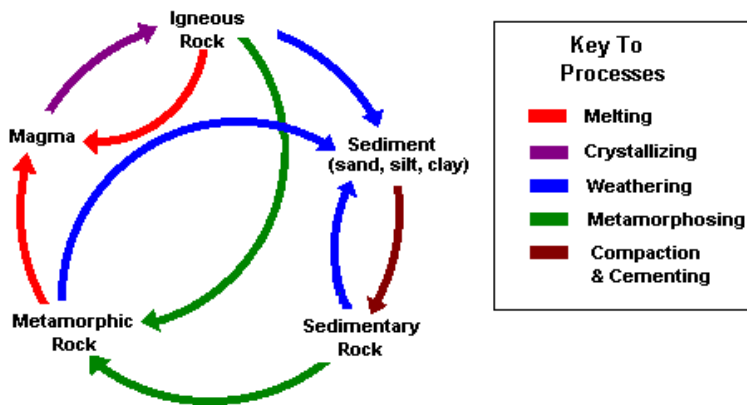


sediment, sand, silt, clay has with the turned into pressure becomes material cementing



Metamorphic Rock is formed by great heat, or pressure, or both. The pressure can come from being buried very deep in the earth's crust, or from the huge plates of the earth's crust pushing against each other. The deeper below the surface of the earth, the higher the temperature, so deep burial also means high temperatures. Another way that high temperatures occur is when magma rises through the earth's upper crust. It is very hot and bakes the rock through which it moves. Hot liquids or gases from the magma also can cause chemical changes in the rock around the magma.

What is the Rock Cycle?



Rocks, like mountains, do not last forever. The weather, running water, and ice wear them down. All kinds of rocks become sediment. Sediment is sand, silt, or clay. As the sediment is buried it is compressed and material dissolved in water cements it together to make it into sedimentary rock. If a great amount of pressure is exerted on the sedimentary rock, or it is heated, it may turn into a metamorphic rock. If rocks are buried deep enough, they

melt. When the rock material is molten, it is called a magma. If the magma moves upward toward the surface it cools and crystallizes to form igneous rocks. This whole process is called the Rock Cycle.

What Minerals Form Rocks?

The list of minerals that commonly form rocks is short. With a little practice you will recognize most of them when you see them. Descriptions of some of the minerals, as they look in rocks, follow: **Quartz**: Quartz is the last mineral to crystallize, so in igneous rocks it never has any definite shape. In rocks, it does not show flat faces. It is usually gray in igneous rocks; gray, white, yellow, or red in sedimentary rocks; and gray or white in metamorphic rocks. It has a glassy, or sometimes waxy, look to it.

Potassic Feldspars*: (microcline, orthoclase) Potassic feldspars are pink or tan, sometimes white. They show flat, shiny faces in igneous rocks. The crystal grains are usually blocky and nearly rectangular. They look like good china.

Plagioclase Feldspars*: (albite, labradorite) Look like the potassic feldspars, except they are white to dark gray, sometimes black. They may show flashes of blue or green.

Micas*: (muscovite, biotite, phlogopite) Micas have very thin layers that peel off (or cleave) very easily. In rocks they are usually flakes or layers of flakes. Muscovite is silvery to brown; biotite is black; phlogopite is a reddish brown. Phlogopite may be found in marble.

Chlorite*: Like mica, but the flakes are usually not as thin and do not peel apart as easily. The color is medium to dark green, sometimes almost black but with a greenish tint.

Hornblende: Hornblende is dark green to black. It shows nearly flat, shiny faces in almost rectangular or long thin needle like crystals in rock. Hornblende is usually found in dark colored metamorphic rocks; sometimes in igneous rocks.

Actinolite and Tremolite: Actinolite and tremolite are usually in long thin blades or needle like crystals. Actinolite is dark green; tremolite is white to gray. The crystals may be parallel to each other, or spread from a point. Actinolite is usually found in schists or gneisses. Tremolite may be found in marble.

Olivine*: Olivine in rocks is an olive green to greenish yellow. In rocks it is in rounded grains. If there is much of it, it is almost sugary. It is found mostly in dark colored igneous rocks.

Calcite and Dolomite: The color is usually white, but can be other colors when impure. Crystal grains show flat shiny faces, often shaped like parallelograms. Calcite and dolomite are

both soft. They are easily scratched with a steel point. Powdered calcite will fizz in white vinegar; dolomite will not. The minerals are found in limestone or dolostone (the rock is dolostone, the mineral is dolomite) and marble.

note: Names marked with an asterisk (*) are groups of related minerals.

Collecting Rocks

Rocks are easier than minerals to collect. That is because they are found nearly everywhere. If you want to start a rock collection, try to find pieces of rock that are freshly broken off a ledge. A ledge is a bed of rock that is sticking out of the ground, or the side of a mountain. It is not loose, but is still part of the bedrock below the soil. Pieces of rock that have been buried in the soil, or rolled in a stream or river are not good to collect. It is difficult to see what they are or what they are made of and you really don't know where they came from..

- Collect clean fresh specimens.
- Make a label that has the name of the rock and the location where it was collected.
- Assign a number to each rock.
- Record in a notebook the name, location where you found it, and number of the rock.
- Paint a small white rectangle on each rock, and write the rock's number on it.

Safety While Collecting Rocks

- Always wear **safety glasses or goggles** when breaking rocks.
- Use only hammers that are intended for breaking rocks. **Do not use a carpenter's claw hammer** (a hard rock can break sharp steel splinters off a claw hammer).
- **Do not climb on dangerous ledges or on quarry walls. Stay away from quarry walls, they might collapse.**
- **Never enter mine tunnels.** They are **very** dangerous!
- If possible, always collect with an adult.

The Rock Identification Key

About the Rock Identification Key

This Rock Key has been designed and written to assist children and adults in identifying the common rocks they find in their back yards and on memorable vacations. Anyone may copy it freely for noncommercial use.

Many thanks to Alan Plante who graciously offered many useful suggestions for both major additions and editorial changes. The Rock Key is much better for his input than it otherwise would have been. Alan's advice has made this web version of the Rock Key a much better document.

I have successfully used the Rock Identification Key, in a flowchart paper format, with more than 6000 elementary school children for more than 20 years. That is not to say that this electronic version will work as well. However, it is my hope that it will.

The kinds of rocks included in the Key are restricted. They are the more common varieties, but it is inevitable that someone will try to identify a rock which is not among those described. In most cases, the process will arrive at a closely related type.

Although The Rock Identification Key is copyrighted, it may be distributed freely for noncommercial use by individuals, educators, and organizations. Under no condition is its inclusion approved in any publication, print or electronic, which is to be sold or for which a fee is charged.

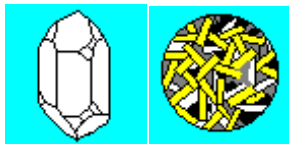
Enjoy. . . and, put a name on that rock!

Using The Rock Key

As you use The Rock Key, you will find a lot of links. They are blue and are underlined. Links let you jump from one place to another in the key. The **Yes** and **No** choices are links. "Clicking" on them jumps to the next question that you need to answer. If it is the last question to finding the name of the rock, the link jumps to the description of the rock. The numbers for each step in the key are not important if you are using the key on your computer. They are included so, if you wish, paper copies may be used.

In the Mineral Descriptions there is always a part called, **Compare To:**, with the names of rocks that look a lot like the one you are reading about. The rock names are links. If you click on one, you jump to the description of that rock.

In order to use The Rock Key there are a few things you need to know:



Crystals: Crystals are what minerals form when they are free to grow in nature; like the quartz crystal in the first drawing. In rocks, crystals grow up against each other. They cannot grow as the quartz crystal did in open space. Crystals in rocks have straight edges and they very often show flat shiny faces that reflect light like tiny mirrors. They look more like the second drawing.

Grains: Grains that are not crystals in rock do not have flat shiny faces. They are rounded, like grain of sand, or jagged, like a piece of broken rock.

Grain Size: Grain size in rocks can mean the size of crystal grains or of fragments:

- **Coarse Grained:** most of the rock is made of grains as large as rice, or larger.
- **Medium Grained:** the individual grains can be seen without a magnifier, but most of the rock is made of grains smaller than rice.
- **Fine Grained:** the individual grains can not be seen without a magnifier (or microscope).

Layers: Layers in rocks show in different ways.

- In some rocks different colored minerals are lined up in ribbons.. Usually there are two colors, often black and white, or green and white, of black and tan or pink. Ribbon like layers are found in the rock, gneiss.
- In schists, the layers are most often thin layers of mica or chlorite around lens shaped masses of feldspar or quartz. The top and bottom is almost always mica or chlorite.
- In sandstones, different sized sand grains sometimes show as different colors. When the grains are sorted by running water or wind, they show different shades of the same color.
- The layers in slate are very thin and straight. The top and bottom layers are usually flat and quite smooth.

Ribbon like Layers



in Gneiss

Mica like Layers



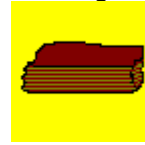
in Schist

Particle Layers



in Sandstone

Thin Cleavage Layers



in Slate

Gas Bubbles: Gas bubbles in rock are sort of round or elongated holes. In pumice, the bubbles may be very tiny to the size of a match head. They are a glass froth that may look something like a sponge or gray, glassy soap bubbles. In scoria or vesicular basalt, the bubbles are larger, often as large as peas. They look like small pockets in the rock.

The Rock Key

1. Is the rock made of crystal grains? (Does it have a lot of flat, shiny faces - maybe tiny to small - that reflect light like little mirrors? You may need to use a magnifier.)

YES - The rock is made of crystal grains with flat shiny surfaces. . . Go to 2

NO - There are no (or not many) shiny, flat, crystal grains. . . Go to 3

2. Does the rock have both layers and crystal grains? (Look carefully for layers , especially along the edges of the rock. You may need a magnifier.)

YES - The rock has both layers and crystals. . . Go to 4

NO - The rock has crystals, but it has no layers. . . Go to 5

3. Does the rock have layers but not crystal grains? (Look carefully for layers, especially along the edges of the rock. You may need a magnifier.)

YES - The rock has layers, and crystal grains are not visible. . . Go to 11

NO - The rock has no layers, and crystal grains are not visible. . . Go to 12

4. Do the layers look like ribbons or bands of minerals running through the rock; and is the rock kind of blocky? (The bands of minerals may be straight or wavy. The rock breaks into blocky chunks, not along its layers.)

YES - The rock has crystals, layers that look like ribbons or bands of minerals running through it, and is kind of blocky . It is. . . 23. Gneiss

NO - The rock has crystals and layers that are thin and do not look like ribbons of minerals. It breaks along the layers. It is. . . 24 Schist

5. Is the entire rock mostly light colored, compared to other rocks? (Look at the whole rock, not just mineral grains in the rock.)

YES - The rock is mostly light colored or light gray minerals grains. . . Go to 6

NO - The rock is mostly medium gray to very dark colored minerals. . . Go to 7

6. Can you scratch glass with the rock? (If it does, the rock is hard. If it doesn't, the rock is soft.) *(Safety note: keep the glass flat on your desk, not in your hand. Carefully press a point of the rock against the glass and pull it about 2cm. Look to see if it scratched the glass. Do not hit the glass with the rock.)*

YES - The rock scratches glass. It has crystals, but has no layers. . . Go to 9

NO - The rock does not scratch glass. It has crystals, but has no layers. It is. . . 25. Marble

7. Is the rock mostly light or medium gray, not very dark gray or black?

YES - The rock is mostly light to medium gray, has crystal grains, and is not layered. It is. . . 31. Diorite

NO - The rock is mostly very dark gray or black. . . Go to 8

8. Can you see crystal grains in most or all of the rock without using a magnifier?

YES - The rock is coarse or medium grained, has crystals, and no layers. . . Go to 10

NO - The rock is fine grained, has crystals, and no layers. It is. . . 32 . Basalt

9. Can you see crystal grains in most or all of the rock without using a magnifier?

YES - The rock is mostly crystal grains. It is medium or coarse grained, has no layers, and is light colored. It is. . . 30. Granite

NO - The rock is mostly fine grained, it has crystal grains, has no layers, and is light colored. It is. . . 29. Rhyolite

10. Is the rock coarse grained? (If the rock is coarse grained, most of the rock mostly is made of crystals that are as large, or larger, than rice. If you can see the crystals without a magnifier, but they are smaller than rice, the rock is medium grained.)

YES - The rock is made of coarse crystal grains. It has no layers, and is dark colored. It is. . . 34. Gabbro

NO - The rock is made of medium crystal grains. It has no layers, and is dark colored. It is. . . 33. Diabase

11. Using the point of a steel nail, can you scrape grains of sand off the rock? (Hold the rock over a clean sheet of paper and scrape it hard with the point of the nail. Rub your finger over the paper. Can you feel grains of sand?)

YES - The rock has layers. It is made of grains of sand. The rock is. . .38. Sandstone

NO - The rock has layers and is not made of grains of sand. . . Go to 13

12. Does the rock have gas bubbles in it? (It may look something like a sponge. Look for rounded holes, or glassy bubbles in the rock. They may be tiny {like a pinhead}, small, or large {like a pea})

YES - The rock has gas bubbles. . .Go to 15

NO - The rock has no gas bubbles. . .Go to 17

13. Does the rock look like it is composed of mostly only one mineral and has many thin flat layers? (The layers are less than 2mm thick, mostly thinner. not thick layers)

YES - The rock has many thin flat layers, seems to have only one mineral, and usually no visible crystals. The rock is. . . 27. Slate

NO - The rock is mostly one mineral, but the layers are thicker (usually more than 4mm). . .Go to 14

14. Is the rock definitely green in color, and does it feel slippery?

YES - The rock is mostly green and slippery. The rock is. . . 28. Serpentine

NO - The rock is not green and slippery. The rock is. . . 39. Shale

15. Is the rock light in weight and mostly light colored (probably gray)?

YES - The rock is full of gas bubbles, is light in weight, and is light colored. The rock is. . . 35. Pumice

NO - The rock is heavy, dark colored, and has some gas bubbles, but the bubbles are mostly larger. . . Go to 16

16. Is the rock dark colored, glassy, with gas bubbles in it? (Does it have some jagged or sharp points?)

YES - The rock is dark colored, glassy, with gas bubbles in it. The rock is. . . 36. Scoria

NO - The rock is gray or black, has a few gas pockets in it, and has no layers. It is not glassy. The rock is. . . 32. Basalt

17. Does the rock look like black glass with no bubbles in it? (It may have some white "snowflakes" in it ,or some reddish bands in it)

YES - The rock looks like black glass. The rock is . . . 37. Obsidian

NO - The rock does not look like a black glass. . . Go to 18

18. Using the point of a steel nail, sand can be scraped off the rock. (Use the point of a steel nail to scrape the rock over a sheet of clean paper. Can you feel sand on the paper?)

YES - Sand can be scraped off the rock. . . Go to 19

NO - Sand cannot be scraped off the rock. . . Go to 20

19. Does the rock contain sand and larger pieces of rock or pebbles?

YES - The rock is composed of sand and pebbles or other larger pieces of rock. . . Go to 22

NO - The rock is made of sand, but not pebbles or other larger pieces of rock. The rock is. . . 38. Sandstone

20. Can the rock scratch glass? (Safety note: keep the glass flat on your desk, not in your hand. Carefully press a point of the rock against the glass and pull it about 2cm. Look to see if it scratched the glass)

YES - The rock scratches glass, but it is not made of sand. . . Go to 21

NO - The rock does not scratch glass. It is not composed of visible crystals. It is. . . 40. Limestone

21. Is the rock white, yellowish, tan, or reddish?

YES - The rock is. . . 26. Quartzite

NO - The rock is either black or gray. The rock is. . . 32. Basalt

22. Are the larger pieces of rock (that are mixed with the sand) rounded pebbles, not blocky or jagged?

YES - The larger pieces are rounded pebbles. The rock is. . . 41. Conglomerate

NO - The larger pieces are jagged and blocky. The rock is. . . 42. Breccia

Mineral Descriptions

Metamorphic Rocks

23. GNEISS (nice)

What Type of Rock Is It? Metamorphic

What Does It Look Like? Gneiss is usually light in color, but it can be quite dark. It looks like it has ribbons or stripes of minerals running through the rock. The grain size is usually fairly coarse. Gneiss usually breaks into blocky pieces, not along the layers. Unlike granite, in which the crystals are randomly arranged, the crystals in gneiss are lined up and in layers. Gneiss is a tough and hard rock.

What Minerals Make Up the Rock? Almost always: feldspars, quartz, and mica. Sometimes: kyanite, garnet, hornblende, tourmaline, magnetite, and many others.

How Was It Formed? Gneiss is formed from another metamorphic rock, called schist. The schist formed from fine grained sedimentary rock (often a shale). Gneiss can be formed also from some igneous rocks, especially granite. It is usually formed under great pressure from moving plates of the earth's crust.

Compare To: schist, granite

24. SCHIST (sh-ist)

What Type of Rock Is It? Metamorphic

What Does It Look Like? Top and bottom layers are usually a silvery, to green, to brown, to black mica, or a green to very dark green chlorite. The micas are often in small flaky crystals. Layers are usually thin, often with lens like layers of quartz between the mica layers. Layers may be somewhat wavy. Grain size varies from medium to coarse. Schist usually splits easily along the layers of mica, unlike gneiss.

What Minerals Make Up the Rock? quartz, feldspar, mica (muscovite, biotite). Sometimes: chlorite, garnet, hornblende, actinolite, kyanite, magnetite, pyrite, staurolite, tourmaline, and many others.

How Was It Formed? Schists are usually formed from shales that were formed from clay or sandy clay, sometimes with a little lime, sometimes from rocks and sediments from volcanoes. Schists are most often formed when plates of the ocean floor push under, into, or up onto a continent. It is the sea floor rocks that get crunched to form schists.

Compare To: gneiss, shale, slate, serpentinite

25. MARBLE (mar'-bul)

What Type of Rock Is It? Metamorphic

What Does It Look Like? Often pure white. It may be streaked or patchy gray, green, tan, or red. Marble is fine grained to very coarse grained and crystals are usually easy to see. The rock is soft; it will not scratch glass (quartzite may look like a fine grained marble, but easily scratches glass). The powdered marble will often fizz with white vinegar. If it does not fizz, it may be dolomitic marble.

What Minerals Make Up the Rock? calcite, or dolomite (dolomitic marble); Sometimes: graphite, pyrite, mica, tremolite, and a few others

How Was It Formed? Marble forms from the metamorphism of limestones.

Compare To: quartzite , limestone

26. QUARTZITE (kwart'-zite)

What Type of Rock Is It? Metamorphic

What Minerals Make Up the Rock? quartz; Sometimes, a little: mica, feldspar, magnetite, pyrite, ilmenite, garnet, and any of a few others.

What Does It Look Like? If the quartzite is pure quartz it is white. It may have a yellowish to reddish color if it contains iron minerals. Rarely, it is black if it contains a lot of magnetite. Sometimes, using a magnifier, the grains of sand from which it formed can be seen. The rock breaks through the grains, not around them (sandstone breaks around the grains). Quartzite often shows lighter colored flakes on a broken surface, where air is behind a very thin chip. Unlike marble, quartzite is very hard and easily scratches glass.

How Was It Formed? Most quartzite is metamorphosed sandstone.

Compare To: marble, sandstone

27. SLATE (sl-ate)

What Type of Rock Is It? Metamorphic

What Minerals Make Up the Rock? micas, feldspars, quartz (but they can not be recognized because the grains are so small you would need a microscope to see them); Sometimes contain: pyrite

What Does It Look Like? Slate can be black, gray, brownish red, bluish gray, or greenish gray. It is very fine grained and has thin, quite smooth, flat layers. Unlike shale, slate easily splits into thin flat pieces. It often will scratch glass, with a little difficulty.

How Was It Formed? Slate is usually formed from clay sediments or shale that has been heated and put under pressure by plate collisions. The pressures and temperatures that form slate are lower than those that form schist.

Compare To: shale, schist, serpentinite

28. SERPENTINITE (Sir'-pen-tin-ite)

What Type of Rock Is It? Metamorphic

What Does It Look Like? Serpentinite feels very slippery. It is more a broken rock than it is a layered rock. The "layers" are sort of flat plates of green rock. They may be thin or more than 2cm thick. Serpentinite is usually green to grayish-green. The flat plates may have long scratch like grooves in them. It may be dull or nearly glassy looking. When serpentine is dull it may be fine to coarse grained. When it is glassy it looks very smooth and has no visible grains.

What Minerals Make Up the Rock? Mostly antigorite, amesite, and lizardite. Sometimes: chrysotile (a type of asbestos), brucite, magnesite, chromite, magnetite and garnets. Talc is often found because serpentine alters to talc.

How Was It Formed? When an ocean floor plate collides with a continental plate, giant slices of the oceanic crust are pushed up into the rocks of the continent. A rock, called peridotite, at the bottom of the oceanic plate is changed to serpentinite because there is less weight on it, the temperature is lower, and water circulates through it. Serpentinite is usually found in mountains that were once at the edge of a continent. Another way serpentinite can form is from peridotites that crystallize deep in the earth's crust from magma. The peridotites are gradually uncovered by erosion, and as they get close to the surface, they alter to serpentinite.

Compare To: diabase, gabbro, slate, schist

Igneous Rocks

29. RHYOLITE (rye'-o-lite)

What Type of Rock Is It? Igneous

What Minerals Make Up the Rock? quartz, feldspars; Sometimes contain: biotite, diopside, hornblende, zircon

What Does It Look Like? Usually light colored; light gray, tan, reddish, greenish, brown. Fine grained, but often contains scattered larger crystals. May contain small pockets that were gas bubbles. Sometimes shows flow lines or bands.

How Was It Formed? Rhyolite is a volcanic rock. It forms from the rapid cooling of a magma or lava that contains a lot of silica (quartz). The molten material often contains gas bubbles which freeze into the rock. Pumice is a kind of rhyolite that has really a lot of tiny gas bubbles in it.

Compare To: pumice, basalt

30. GRANITE (gran'-it)

What Type of Rock Is It? Igneous

What Minerals Make Up the Rock? quartz, feldspars (microcline, orthoclase, albite), biotite, muscovite; Sometimes contain: hornblende, augite, magnetite, zircon

What Does It Look Like? The feldspars give granite most of its color, which may be white to light gray, yellowish, or pink. The quartz is usually smoky gray or white. Black specks of biotite, or sometimes hornblende, are common. So is silvery to brownish muscovite. Granite is coarse grained to very coarse grained. The crystals are randomly arranged (unlike gneiss where they are in lines or layers).

How Was It Formed? Granite forms deep in the earth's crust from cooling magma. The magma contains a lot of silica (quartz). Slow cooling produces the large crystals in granite.

Compare To: gneiss diorite

31. DIORITE (die'-or-ite)

What Type of Rock Is It? Igneous

What Minerals Make Up the Rock? Dark colored plagioclase, hornblende, pyroxene, and sometimes a little quartz. May contain: light colored plagioclase feldspars, but only a little.

What Does It Look Like? Mostly it looks like a dark colored granite. The dark colored plagioclase feldspars and pyroxenes give it a darker color. It is usually medium to dark gray. Unlike granite, diorite has no mica, or very little, and those are dark colored. It is coarse grained (larger than rice).

How Was It Formed? Diorite forms deep in the earth's crust from cooling magma - just like granite. But, the magma does not contain a lot of quartz or the light colored minerals that make up the granite. Instead it contains only dark colored minerals.

Compare To: granite, diabase

32. BASALT (buh-salt')

What Type of Rock Is It? Igneous

What Does It Look Like? Basalt is dark gray to black. When exposed to the weather, it may turn yellow or brown on its surface. Basalt is fine grained rock. You may or may not be able to see crystals with a hand magnifier. The crystals are often microscopic. Basalt is a hard, tough rock. It is difficult to break. Sometimes, basalt contains gas bubbles. It is then called vesicular basalt.

What Minerals Make Up the Rock? plagioclase feldspars, augite, hypersthene, olivine

How Was It Formed? Basalt is a volcanic rock. It is formed from a magma that is rich in iron and magnesium, and poor in silica (quartz). The magma erupts from a volcano or a fissure (a crack in the earth's surface) as lava. Because the lava cools rather quickly, basalt is fine grained. There is not time enough for the grains to become larger.

Compare To: rhyolite, diabase, gabbro

33. DIABASE (die'-uh-base)

What Type of Rock Is It? Igneous

What Does It Look Like? Diabase is dark green to black, sometimes with some white crystals scattered through it. When exposed to the weather its surface often turns brown. It has a medium grain size (you can see them without a magnifier, but they are smaller than rice). It is a tough, hard rock.

What Minerals Make Up the Rock? plagioclase feldspars, augite; Sometimes contains: hornblende, magnetite, olivine, glass

How Was It Formed? Diabase forms from a magma that is rich in iron and magnesium, and poor in silica (quartz). The magma is forced into cracks or between layers of rock near the earth's surface. Diabase is from the same kind of magma as basalt, but because it cools more slowly, it develops slightly larger crystals.

Compare To: basalt, gabbro, diorite, serpentinite

34. GABBRO (gab'-row)

What Type of Rock Is It? Igneous

What Does It Look Like? Gabbro is dark green to black. When exposed to the weather its surface often turns brown. It has a large grain size (most of the rock is grains larger than rice).

What Minerals Make Up the Rock? plagioclase feldspars, augite, hypersthene, olivine; Sometimes contains: magnetite, chromite, titanite, ilmenite.

How Was It Formed? Gabbro forms from a magma that is rich in iron and magnesium, and poor in silica (quartz). The magma cools and crystallizes deep below the earth's surface. Gabbro is from the same kind of magma as basalt and diabase, but because it cools more slowly, it develops larger crystals.

Compare To: basalt, diabase, serpentinite

35. PUMICE (pum'-iss)

What Type of Rock Is It? Igneous

What Does It Look Like? Pumice is very light gray to a medium gray in color. It contains a large number of gas bubbles, each surrounded by a thin layer of volcanic glass. Pumice looks something like a sponge. It is very light in weight. Most pieces of pumice will float on water. Flow lines or bands may show.

What Minerals Make Up the Rock? glass, any mineral grains are unusual.

How Was It Formed? Pumice is explosively blown out of volcanoes. It comes from a highly silicic magma that is thick and sticky. The gases that are trapped in the bubbles are the same that cause the explosive eruption. It is the same kind of magma which would form rhyolite or granite.

Compare To: scoria, rhyolite

36. SCORIA (score'-ee-uh)

What Type of Rock Is It? Igneous

What Does It Look Like? The color is usually black, dark gray, brown, or dark green. Scoria is glassy, smooth to rough, and contains gas bubbles. Unlike pumice, it has many fewer, usually larger bubbles, and is moderately heavy.

What Minerals Make Up the Rock? mainly a glass

How Was It Formed? Scoria usually is from the top of a lava flow, so it is volcanic. It forms from a somewhat sticky lava. Because it is on the top of the flow, it cools rather quickly, before many crystals start to form.

Compare To: pumice, basalt

37. OBSIDIAN (obb-sid'-ee-an)

What Type of Rock Is It? Igneous

What Does It Look Like? Obsidian is a glass and is usually black, although sometimes it may be slightly grayish or greenish. It may include some white crystals that look like snowflakes (snowflake obsidian). It may include swirls of a red color. Obsidian breaks and chips like glass. The location where the chip came out is scoop shaped, like the inside of a clam shell. The chip often has ridges that are semicircular. This kind of break is called a conchoidal fracture.

What Minerals Make Up the Rock? black glass

How Was It Formed? Obsidian is volcanic. It forms from rapid cooling lava that has a lot of silica. The lava cools so fast that crystals do not have time to form.

Sedimentary Rocks

38. SANDSTONE (sand'-stone)

What Type of Rock Is It? Sedimentary

What Does It Look Like? Sandstone is often red to brown, light gray to nearly white. Sometimes it is yellow or green. It usually is composed of rounded grains that are all of the same size; and it is usually medium grained. Some sandstones show slight color variations in layering.

What Minerals Make Up the Rock? quartz; Sometimes contains: feldspars, mica, glauconite (in green colored sandstone), magnetite, garnet, rutile, ilmenite

How Was It Formed? quartz sand that is produced by the weathering of other rocks (such as granite, gneiss, and other sandstones) is deposited by rivers, waves, or wind. The sediment may have been a sand bar, an ocean beach, or desert sand dunes. The sand is buried under other sediments, compacted by the weight of those sediments, and cemented by material dissolved in water that seeps through it.

Related Rocks: Arkose: Usually red or pink, may be gray. Grains are angular. Arkose contains more than 25% feldspar with quartz. Medium to coarse grained. Greywacke: Black or dark green. Usually contains coarse angular grains included with fine grains.

39. SHALE (sh-ale)

What Type of Rock Is It? Sedimentary

What Does It Look Like? Shale may be black, gray, red, brown, dark green, or blue. It is fine grained, so particles usually can not be seen. When moistened, shale usually smells like wet mud. **What Minerals Make Up the Rock?** clay minerals; Sometimes with some quartz sand, pyrite, gypsum

How Was It Formed? Clay sediments settle in quiet lakes, lagoons, bays, or off-shore areas. When buried and compacted the clays become shale. Iron oxides often help to cement the particles together.

Compare To: slate schist

40. LIMESTONE (lime'-stone)

What Type of Rock Is It? Sedimentary

What Does It Look Like? Limestone is usually white, gray, tan, or yellow. It may contain impurities to make it red or black. Fossils are often found in limestone. It may be very smooth or even sugary, fine grained, or medium grained. The powdered rock will usually fizz in white vinegar. Unlike marble, limestone is not composed of visible crystals. **What Minerals Make Up the Rock?** mostly calcite

How Was It Formed? Most limestone is formed by a chemical reaction in sea water. The reaction makes a lime mud which sinks to the bottom to form the limestone. Some limestones are formed from buried coral reefs.

Related Rocks: Dolostone (doe'-low-stone) looks like limestone, but is composed of the mineral, dolomite. Powdered dolostone does not fizz with white vinegar. Dolostone forms on the ocean floor.

Compare To: marble

41. CONGLOMERATE (cun-glom'-er-at)

What Type of Rock Is It? Sedimentary

What Does It Look Like? Conglomerate looks like a mixture of sand and different sizes of rounded pebbles. The pebbles are the important observation.

What Minerals Make Up the Rock? mostly quartz

How Was It Formed? Sand and pebbles collect along sea shores, lake shores, or river banks. They are compacted by the weight of sediments that collect above them and cemented by material dissolved in the water that seeps through them.

Related Rocks: Breccia (brech'-ee-uh) looks like conglomerate, but the "pebbles" in it are jagged and blocky, not rounded.

42. BRECCIA (brech'-ee-uh)

What Type of Rock Is It? Sedimentary

What Does It Look Like? Like conglomerate, but the "pebbles" in it are jagged and blocky, not rounded.

What Minerals Make Up the Rock? The "cement" holding the rock together is mostly quartz, but the pebbles can be almost any kind of rock - often quartzite, granite, or another tough rock that does not easily erode into sand or silt.

How Was It Formed? Where the environment is dry - like in deserts. When mountains erode broken pieces of rock don't get carried away by streams. They just pile up. When they get deep enough, the weight above compresses them and they get cemented together.

Compare To: Conglomerate