

THE ROCK KEY

Use this key to ask and answer questions on your unknown rock specimens. The key can **help** guide you to the correct rock identification.

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

- The rock is made of crystal grains with flat shiny surfaces... **Go to 2**
- 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 or bands, especially along the edges of the rock. You may need a magnifier or hand lens.)

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

- The rock has layers, and crystal grains are not visible (or very sparse)... **Go to 11**
- The rock has no layers, and crystal grains are not visible (or very sparse)... **Go to 12**

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

- The rock has crystals, layers that look like ribbons or bands of minerals running through it, and is somewhat blocky. It is... **Go to 23**
- The rock has crystals and layers that are thin and do not look like ribbons of minerals. It breaks along the layers. It is... **Go to 24**

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

- The rock is mostly light colored or light gray minerals grains... **Go to 6**
- 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 does not, 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.)

- The rock scratches glass. It has crystals, but has no layers... **Go to 9**
- The rock does not scratch glass. It has crystals, but has no layers. It is... **Go to 25**

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

- The rock is mostly light to medium gray, has crystal grains, and is not layered... **Go to 31**
- 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?

- The rock is coarse or medium grained, has crystals, and no layers... **Go to 10**
- The rock is fine grained, has crystals, and no layers. It is... **Go to 32**

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

- The rock is mostly crystal grains. It is medium or coarse grained, has no layers, and is light colored. It is... **Go to 30**
- The rock is mostly fine grained; it has crystal grains, has no layers, and is light colored. It is... **Go to 29**

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

- The rock is made of coarse crystal grains. It has no layers, and is dark colored. It is... **Go to 34**
- The rock is made of medium crystal grains. It has no layers, and is dark colored. It is... **Go to 33**

11. Using the point of a steel nail, can grains of sand be scraped 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?

Note: if you feel grains, but they fall apart or turn to dust when you rub your finger over the paper, the grains are NOT sand)

- The rock has layers. It is made of grains of sand. The rock is... **Go to 38**
- The rock has layers and is not made of grains of sand... **Go to 13**

12. Does the rock have gas bubbles (vesicles) 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)

- The rock has gas bubbles... **Go to 15**
- The rock has no gas bubbles... **Go to 17**

13. Does the rock look like it is composed of mostly one mineral and does it have many thin, flat layers? Use your hand lens! (The layers are less than 2mm thick, mostly thinner, not thick layers)

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

- The rock is mostly green and slippery. The rock is... **Go to 28**
- The rock is not green and slippery. The rock is... **Go to 39**

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

- The rock is full of gas bubbles, is light in weight, and is light colored. The rock is... **Go to 35**
- The rock is not light in weight, 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?)

- The rock is dark colored, glassy, with gas bubbles in it. The rock is... **Go to 36**
- The rock is gray or black, has a few gas pockets in it, and has no layers. It is not glassy. The rock is... **Go to 32**

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

- The rock looks like black glass. The rock is... **Go to 37**
- The rock does not look like 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?)

- Sand can be scraped off the rock... **Go to 19**
- Sand cannot be scraped off the rock... **Go to 20**

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

- The rock is composed of sand and pebbles or other larger pieces of rock... **Go to 22**
- The rock is made of sand, but not pebbles or other larger pieces of rock. The rock is... **Go to 38**

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)

- The rock scratches glass, but it is not made of sand... **Go to 21**
- The rock does not scratch glass. It is not composed of visible crystals... **Go to 40**

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

- The rock is white, yellowish, tan, or reddish... **Go to 26**
- The rock is either black or gray. The rock is... **Go to 32**

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

- The larger pieces are rounded pebbles. The rock is... **Go to 41**
- The larger pieces are jagged and blocky. The rock is... **Go to 42**

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 rocks (often shale). Gneiss can also be formed from some igneous rocks, especially granite. It is usually formed under great heat and pressure from movement along tectonic plates.

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, and 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 are crunched and deformed 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 composed of 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 cannot be recognized because the grains are so small you would need a microscope to see them); sometimes contains: 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 serpentinite 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, or 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 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 contains 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 that 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. It 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. However, 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 crystal grains to grow and become larger.

Compare To: rhyolite, diabase, and 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, olivene, 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, olivene; 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? Similar minerals to rhyolite, however, 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 similar to magma that 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? Plagioclase, pyroxene, and olivine; minor apatite, biotite, hematite, hornblende, ilmenite, magnetite, and quartz.

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. Since 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 volcanic 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) and 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 conchoidal fracture.

What minerals make up the rock? Magnetite, hornblende, pyroxene, plagioclase, and biotite, the red color sometimes comes from inclusions of hematite or limonite (iron oxide).

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? Primarily quartz but sometimes contains feldspars, mica, glauconite (in green colored sandstone), magnetite, garnet, rutile, and/or 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 cannot 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? It depends upon what the pebbles are composed of, but 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 are 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? Typically in dry environments, such as deserts. When mountains erode broken pieces of rock that aren't carried away by streams, they accumulate over time. When they are buried deep enough, the weight above compresses them and they cannot be cemented together.

Compare To: Conglomerate