Mineral ID Guide

What tests can you use to identify a mineral?

Color - Describe the color of your mineral. Color is one of the least reliable tests for identifying a mineral sample, but may provide some clues depending on the specimen.

Streak - The streak is representative of the color of the mineral when it is ground into a fine powder and may not be the same as the color of the mineral. To obtain a streak, rub the mineral across the white plate provided in your testing kit. Streak may be described as colorless, white, black, gray, red, etc.
CAUTION: The streak plate has a hardness of seven. Using minerals harder than seven will damage the streak plate.

Hardness - Mohs Scale of Hardness is commonly used to determine the hardness of a mineral ranging from 1 for the softest mineral to 10 for the hardest mineral. To determine a mineral's hardness, try scratching the mineral with an object (fingernail, coin, nail, or piece of glass) or scratching an object with a mineral sample. Which one is harder - the object or the mineral?
Examples: If a mineral is scratched by a fingernail, it would be softer than 2.5. If the mineral scratches a penny, it would be harder than a 3.

#	Mineral	Common Objects
1	**Talc**	Easily scratched by fingernail
2	**Gypsum**	Scratched by fingernail (2.5)
3	**Calcite**	Very easily scratched by nail (5.5-6); will not scratch penny (3)
4	**Fluorite**	Easily scratched by nail
5	**Apatite**	Difficult to scratch with nail; will not scratch glass (5.5-6)
6	**Feldspars**	Scratched by steel file (6.5-7); may barely scratch glass
7	**Quartz**	May barely scratch steel file; easily scratches glass
8	**Topaz**	Scratches a steel file or nail (6.5-7) as well as the streak plate (7)
9	**Corundum**	
10	**Diamond**	

Texture - How does the mineral feel?

Gritty or sandy?	Powdery or chalky?	Smooth like glass?
Sharp like metal?	Soapy or greasy?	Smooth like wax?

Transparency - Can you see through it? Some minerals are highly transparent and you can see through them. Minerals that are considered translucent only allow light to pass through it. Other minerals are opaque, which means that you cannot see through them.

Luster - How would you describe the way the mineral shines?

Metallic - Looks like metal or appears to have metal flakes
Glassy or vitreous - Shines like glass
Earthy or chalky - Dull; does not reflect much light
Waxy, silky, or pearly - Has a muted shine; may resemble shells or pearls
Other? Describe in your own words.

Crystal Shape - Does the mineral have a well-defined crystal shape? Some minerals show well-defined crystals, while others may have crystals that are too small or hard to distinguish. Describe the crystals in the sample in your own words or sketch a diagram on your data page. How many sides does it have? Does it look like a cube or a pyramid? Provide as much detail as possible.

Cleavage or Fracture - This test describes the way a mineral breaks, which depends on the way the atoms of a mineral are arranged. Some crystals are formed from atoms that have strong bonds between them, while others have areas of weakness. The crystals will tend to break (or cleave) where the bonds between the atoms are the weakest.
CAUTION: Don't break the testing samples unless you have permission from your teacher! Examine the outer surfaces of a mineral specimen for clues!

Cleavage occurs as a mineral breaks smoothly along even planes or surfaces. A few examples include mica forming sheets and halite or galena forming cubes.

Fracture occurs when a mineral breaks into odd shapes or an irregular pattern. It may be described as uneven, splintery, conchoidal (shell-like), jagged, or granular.

Other Tests You Can Try ...

Double Refraction - Some minerals, such as some calcites, cause a double image when placed over words in a book or an object.

Magnetic Attraction - Was the mineral attracted to a magnet, or does it act like a magnet? If so, it might be magnetite.

Fluorescence - Does it glow under ultraviolet light? If so, it might be fluorite.

Specific Gravity — This property is the weight of the mineral relative to the weight of an equal volume of water. Minerals with a high specific gravity or density feel heavy for their size, such as galena. Those with a low specific gravity, such as graphite, feel light for their size.

Reaction with Acids - Does it fizz when exposed to hydrochloric acid? If yes, it is a carbonate, such as calcite or dolomite.
WARNING: You must have your teacher's permission to perform the acid test!

Earth Science Regents

Igneous, Sedimentary, or Metamorphic?

I know a rock is igneous if:

I see randomly located interlocking crystals
or
I see vesicles where gases escaped as lava cooled
or
The texture of the rock is glassy due to extremely rapid cooling (it is Obsidian!)

I know a rock is sedimentary if:

I see layers of sediment cemented together
and/or
I see ripple marks
and/or
I see mud cracks
and/or
I see fossils
or
I see cobbles, pebbles, and sand grains cemented together

I know a rock is metamorphic if:

I see bands of light and dark minerals
or
I see distorted / folded, foliated structure
or
I see foliated “layers” of platey, flakey minerals like mica
or
I see a very hard, resistant, uniform, and weathered quartzy boulder

Name: _____ Date: _____

Class: _____ Teacher: _____

ROCKS - Important Keywords

When you take an exam that contains questions about rocks, there are certain words that are dead giveaways as to which rock type you are looking for as an answer. This list should help. Some words are linked to online illustrations or definitions.

IGNEOUS ROCKS	
lava, magma	intergrown crystals
volcanic, plutonic	felsic, mafic
extrusive, intrusive	glassy
crystalline	holes, vesicular
Processes: Melting and Solidification	
SEDIMENTARY ROCKS	
sediments	evaporites, precipitates
particles, fragments	layers
grain size	horizontal layers
clastic, bioclastic, chemical	mud cracks
* fossils * (See page 2.)	underwater, seawater, inland sea
Processes – Formation of Clastic Rocks: Compaction and Cementation	
Processes – Formation of Non-clastic Rocks: Evaporation, Precipitation	
METAMORPHIC ROCKS	
recrystallization	distortions, folds, ptygmatic folds
crystalline	banding
dense, hard	enlarged minerals (enlarged mica, garnet minerals common in schist)
intergrown crystals	foliation
new minerals present	
Processes: Heat and Pressure	

Remember!

*** Here is a general rule: Fossils are found in Sedimentary Rocks!**

Why are fossils *not found* in igneous rocks?

Think about how igneous rocks are formed: from melted (liquid) rock. If it is basaltic lava, temperatures can be as hot as 1170°C to 1175°C (2140°F)!
What if there were a fossil in a limestone sedimentary rock? Then suppose that rock underwent subduction due to plate tectonic movement, melting as it descended towards Earth's mantle, and then what if it was finally ejected as lava onto Earth's surface, eventually cooling and solidifying into an igneous rock.
What a rock history tale!

Well, what do you think would have happened to the original fossil?
You guessed it. Destroyed; melted; gone; no more fossil.

And, if an organism dies and is buried by a lava flow, then it has no chance of becoming a fossil. Watch this animation and place the dead animal ON THE VOLCANO, then watch what would happen.

Why are fossils not commonly found in metamorphic rocks?
Or if there are any fossils, why do they become stretched out and often unrecognizable? Consider the processes of metamorphism for the answer.

The processes that form metamorphic rocks are *extreme heat and pressure*.
Suppose there was a fossil in a sedimentary rock and then that rock was heated and pressed to the limit; the kind of heat and pressure that happens when two huge tectonic plates collide. Do you think the fossil will remain intact or become so distorted that it is not even identifiable anymore?

All the crystals that made up the fossil would rearrange themselves and become part of the metamorphic rock structure. Once again, the fossil would be distorted or obliterated and totally destroyed.
Open this link to see a sedimentary conglomerate with rounded fragments and then compare it with a metamorphic metaconglomerate where the pebbles within the rock have become distorted due to heat and pressure.
What happened to these fragments would also happen to the remains of once living organisms.

Fossil formation requires quick burial and *slow decomposition*. What better environment for this to happen that in a sedimentary basin where fragments are continuously being deposited by rivers.

Click on the links below to see excellent animations about fossilization and quick burial.

FOSSILIZATION and BURYING BODIES

Remember!

Rocks are made up of one or more minerals.

Which sedimentary rock IS NOT made from minerals?
COAL! The composition of coal is CARBON which is an element, not a mineral.

Remember!

The size of the crystals in an igneous rock is determined by the Rock's Cooling History, meaning WHERE IT COOLED and HOW LONG IT TOOK TO COOL, as it went about the process of solidifying into a hard rock.

Slow Cooling Underground - If a rock cools underground then crystals have a lot of time to form. Therefore, the crystals will be large and visible in that igneous rock.
Examples: granite, gabbro, diorite

Quick Cooling On the Earth's Surface - Mineral crystals will be present within the rock but you won't see them with the naked eye. They are very small.
Examples: rhyolite, basalt, andesite

Super Quick Cooling At or Above Ground - Super-quick cooling (quenching) does not allow for the formation of mineral crystals. That's right. No crystals at all. These igneous rocks are termed "glassy". They have a *chemical composition* but not a *mineral composition*. Quick cooling is likely to occur if lava is forcefully ejected from a volcanic vent traveling and solidifying in the air.
Examples: obsidian, pumice, scoria

Two-Stage Cooling History Below and Above Ground - Some rocks experience a 2-stage cooling history. One will see visible crystals called (phenocryts) among a plain background (groundmass) of smaller, invisible crystals.
This type of rock first cooled underground and the larger, visible crystals formed. Slow cooling underground means larger crystal sizes.
Before the rock was completely solidified, the magma in which it was forming erupted as lava onto Earth's surface and the rest of the invisible crystal groundmass was formed. Quick cooling on Earth's surface means smaller crystal sizes or no mineral crystals at all.
The rock is called a porphyry and Andesite Porphyry is one example of an igneous rock formed by two-stages of cooling.
